HSL No. 73-5
MARCH 9, 1973

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U.S. Department of Transportation
National Highway Traffic Safety Administration

Highway Safety Literature

... A SEMI-MONTHLY ABSTRACT JOURNAL

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Documents containing several articles are announced as a complete volume in the subject category most applicable to it as a whole. Entries for individual articles are listed in their most specific category.

SAMPLE ENTRIES

Subject Categories

NHTSA Accession No. HS-800 218 Fld. 5/21; 5/9

Title of document: AN INVESTIGATION OF USED CAR SAFETY STANDARDS–SAFETY INDEX: FINAL REPORT. VOL. 6 – APPENDICES G-L

Personal author(s): by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams

Corporate author: Operations Research, Inc.

Pagination

Publication date: 1969 150p

Contract FH-11-6921 Report no. ORI-TR-553-Vol. 6; PB-190 523

Abstract: Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks.

Search terms; Wear; Trucks; Failures; Used cars; Inspection standards

Availability: NTIS

HS-004 497 Fld. 5/19

AUTO THEFT–THE PROBLEM AND THE CHALLENGE

by Thomas A. Williams, Sr.

Journal citation: Published in *FBI Law Enforcement Bulletin* v37 n12 p15-7 (Dec. 1968)

Gives figures on the extent of the auto theft problem and comments on anti-theft devices available now or in the planning stage.

Search terms: Theft; Theft protection; Stolen cars

(Note: If the date of a report or Journal article is not given, the small letters nd will appear)

NOTE: ( ) Numbers in parentheses following certain subject groups indicate the Highway Safety Program Standards (No. 1 and up) and/or Federal Motor Vehicle Safety Standards (No. 101 and up) which may apply to these groups.

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- /3 Investigation (10, 14-15)
- /4 Locations (9, 14)
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*All Federal Motor Vehicle Safety Standards apply to passenger vehicles. An asterisk before a subject group indicates additional types of vehicles to which the indicated standards may apply.

- /1 Brake Systems (102, 105-6, 116)
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1/0 ACCIDENTS

1/1 Emergency Services

HS-012 262 Fld. 1/1

A PLAN FOR A CASUALTY CARE AND TRANSPORTATION PROGRAM

by R. J. Wheeler; M. Dale

Published in *Highway Research Record* n402 p37-44 (1972)

1972

Sponsored by Highway Res. Board Com. on Motorist Services.

A general plan for organizing and initiating a medical emergency service program is outlined. For competent and economical operation, it is imperative that preliminary planning of the entire operation be carried out on a statewide basis to prevent wasteful duplication and to ensure that each area has adequate facilities available. The selection of personnel, their training, and their salaries will be the largest single item of the service. The system is dependent on a coordinated communications system with links from the local areas to district and regional bases. Intercommunication with law enforcement and other emergency personnel is also vital. An outline for ambulance design is presented in addition to suggestions for an auxiliary trailer to be used in disaster conditions.

Search terms: Emergency medical services; Transportation of injured; Ambulance personnel training; Ambulance personnel; State planning; Ambulance design; Missouri; Emergency reporting systems

1/3 Investigation

HS-012 261 Fld. 1/3; 3/11; 2/9

TRAFFIC ENGINEERING FOR PEDESTRIAN SAFETY: SOME NEW DATA AND SOLUTIONS

by M. B. Snyder

National Hwy. Traf. Safety Administration, N19900

Published in *Highway Research Record* n406 p21-7 (1972)

1972 3refs

This paper describes involvement patterns for a number of specific types of pedestrian accidents including dart-out, intersection dash, multiple threat, vehicle turn or merge with attention conflict, and bus stop related accidents. It also describes traffic engineering actions designed to change the behavior of pedestrians and drivers to make them more likely to avoid these specific types of accidents. The patterns and solutions are drawn from a study of over 2,100 individual pedestrian accident cases.

Search terms: Pedestrian accidents; Traffic engineering; Vehicle pedestrian collisions; Accident types; Accident causes; Accident rates; Accident prevention; Pedestrian behavior; Pedestrian visibility; Accident factors; Traffic control devices

HS-012 294 Fld. 1/3; 2/7; 4/3

FOG AND ROAD TRAFFIC

by R. L. Moore; L. Cooper

Transport and Road Res. Lab. (England), T33900

1972 47p 60refs
Report no. TRRL-LR-446

Thick fog occurs in Great Britain on about 10 days each year. Overall some 2% of all road casualties occur in foggy weather. Although the total number of motorway fog accidents is small, accidents per kilometer are more numerous than on other roads and more serious. The physics of fog and the prospects of reducing the number of fog accidents by fog dispersal, better warning, improved lighting, and the use of electromagnetic and acoustic radar are discussed. Current valuations of accident costs are used to estimate the additional expenditure on vehicles and roads that might be justified assuming that it resulted in a halving of fog accidents. It is probable that the most worthwhile countermeasure to fog accidents may be found in systems of traffic control that have a wider application than only in fog.

Search terms: Fog; Fog dispersal; Fog warning systems; Weather caused accidents; Reduced visibility; Front lamps; Rear lamps; Street lighting; Benefit cost analysis; Accident costs; Accident prevention; Day vs night accidents; Great Britain; Light transmission; Radar; Accident severity index; Fog driving; Sight distances; Accident studies

HS-012 298 Fld. 1/3; 4/5

IMPROVING THE RESEARCHER'S EFFECTIVENESS: HOW READABILITY AND INFORMATION FACTORS AFFECT COMPUTERIZED ACCIDENT DATA ANALYSIS

by R. J. Matsura

Published in *HIT Lab Reports* p4-12 (Dec 1971)

1971 2refs

A second-generation computer technique has been developed to improve the readability of computerized accident data. The effectiveness of the accident researcher in performing analyses of data is dependent upon the factors of readability and information, which differ for various computer programs. In a survey conducted among the Highway Safety Research Institute systems analysis staff, readability and information content for two computerized and two noncomputerized methods of accident reconstruction were rated on a scale from one to ten. The data set listing is used frequently, compared to the other methods, because of its ease of access and great economy. The casewriter program, which is a recent innovation derivative of the data set listing program, has

1/3 Investigation (Cont'd.)

HS-012 298 (Cont'd.)

a higher average index than the data set listing, and should be seeing increasing use in the future. Recent and future upgrading of the computerized tools will yield great improvements by cutting research time, and by opening up new computer applications.

Search terms: Accident research; Electronic accident analysis; Accident reconstruction; Information retrieval; Coding systems; Computer programs; Automated accident records; Accident case reports

HS-012 318 Fld. 1/3; 3/6; 4/7

THE DISTRIBUTION AND PREDICTION OF DRIVER ACCIDENT FREQUENCIES

by R. C. Peck; R. S. McBride; R. S. Coppin

Published in *Accident Analysis and Prevention* v2 n4 p243-99 (Mar 1971)

1971 50refs

An objective of this study was to evaluate the California point system whereby drivers are selected for driver improvement action. A system which selects out for treatment those drivers who are most likely to be involved in accidents was generated empirically by means of multiple regression techniques and its accident validity compared to that of the present a priori point system. Biographical and driver record information from a random 2% sample of California drivers was recorded and analyzed. This study showed the traffic conviction record to be among the best unique predictors of accident frequency. The present findings provide general empirical support for the selective application of driver improvement techniques based on driver record information. At the same time, the findings also indicate that highly-selective treatment programs can never be expected to result in a dramatic reduction of the overall accident rate. Greater effort should be expended in developing inexpensive driver improvement techniques for use on the general driving population.

Search terms: Accident risk forecasting; Accident proneness; Point systems; Driver records; Correlation analysis; Regression analysis; Variance analysis; California; Problem drivers; Marital status; Driver age; Driver sex; Accident rates; Traffic law violations; Convictions; Male drivers; Driver improvement; Mathematical models; Driver characteristics; Probability theory; Female drivers; Accident free drivers; Accident repeater drivers; Questionnaires; Poisson density functions

HS-600 675 Fld. 1/3

TRI-LEVEL ACCIDENT INVESTIGATION SUMMARIES: LEVEL 3-A, INJURY CAUSATION, VOL. 1, NO. 2

Cornell Aeronautical Lab., Inc., C67200

1972 216p 2refs
Contract FH-11-7079

Summary report for Dec 1970-Jan 1971.

Injury producing accidents investigated by the Cornell Aeronautical Laboratory Team to determine the specific injuries incurred and identify the specific interior components which caused such injuries are described. This volume contains summaries of 50 injury causation cases.

Search terms: Trilevel accident investigation; Crash phase; Postcrash phase; Precrash phase; Accident scale drawings; Injury causes; Injury severity; Accident case reports; Multidisciplinary teams; Weather; Damage; Secondary collisions; Injuries; Automobile models

HS-800 371 Fld. 1/3

A MULTIDISCIPLINARY CRASH STUDY TEAM SUMMARY REPORT. FINAL REPORT

Miami Univ., Fla., M29100

1970 126p
Contract FH-11-7224

Thirty crash incidents in which there was property damage, personal injury, fatality or any combination thereof were studied. The cases were selected primarily on the basis that an involved vehicle be of the model year 1968 or later. Certain cases which did not meet the criteria of vehicle year were selected based on their individual merit and particular relationship to a characteristic not related to model year of vehicle such as, traffic engineering hazards, human factors involvement or assignment by the Department of Transportation. It was found that driver licensing techniques are inadequate and alcohol plays a most significant role in fatal vehicular crashes. Vehicle construction, for the purpose of providing occupants with safe packaging, is not adequate for today's driving habits. It is necessary to establish certain minimum standards for roadway design, construction, and maintenance.

Search terms: Multidisciplinary teams; Accident case reports; Precrash phase; Crash phase; Postcrash phase; Driver intoxication; Drinking drivers; Automobile interior design; Highway characteristics; Driver licensing; Injury causes; Property damage accidents; Driver records; Weather; Automobile models

AVAILABILITY: NTIS

HS-800 735 Fld. 1/3; 1/2; 1/5

AN ANALYSIS OF ACCIDENTS IN NEW YORK STATE BY MAKE OF VEHICLE. FINAL REPORT

by P. L. Milie

New York (State) Dept. of Motor Vehicles, N51000

1972 100p 7refs
Contract FH-11-6799

This report analyzes the statistics of relative crash performance of 45 lines of domestic cars and 10 makes of foreign cars, using reportable accident data from 1969 and 1970 New York State accidents. The influence of the property damage accident reporting threshold made it necessary to study cars within weight and value categories. There was an excess of property damage reports for new and/or expensive cars, called the "luxury effect." The analysis of safety belt effectiveness shows the injury severity to the driver wearing a safety belt was much less than to one who was not. Domestic cars were similar, within categories, in injury severity to a driver wearing his safety belt. Foreign makes were not. When the safety belt was not worn, differences were found in both domestic and foreign makes. The effectiveness of federal vehicle safety design and equipment mandates was studied. The decrease in severity from 1965 model year cars was significant for the 1968 and succeeding model year cars.

Search terms: Accidents by vehicle make; New York (State); Accident statistics; Accident analysis; Statistical analysis; Injury severity; Driver injuries; Driver fatalities; Accidents by vehicle size; Accident rates; Foreign automobiles; Fatality rates; Injury rates; Seat belt effectiveness; Seat belt usage; Vehicle mileage; Vehicle age; Injuries by vehicle age; Injuries by vehicle make; Automobile models; Property damage accidents; Luxury automobiles

AVAILABILITY: NTIS

HS-820 179 Fld. 1/3; 3/4; 4/7

DRIVER EXPOSURE—INDIRECT APPROACH FOR OBTAINING RELATIVE MEASURES

by E. C. Cerrelli

National Hwy. Traf. Safety Administration, N19900

1972 116p 5refs

Appendix 2: *The Sensitivity of Certain Indices Associated with Two-Vehicle Accidents,* by A. R. Craw and R. Ku, National Bureau of Standards Report 10638, 1972, 36p.

The efforts in this study are aimed at obtaining a measure of the exposure which a class of drivers experiences relative to other similar classes. These driver classes have been identified by age group and sex. A measure of relative exposure has been estimated for each of the classes under varying environmental conditions. The sources of data were the driver licensing and all motor vehicles accident records as kept by 25 States for the year 1969. These States account for over 50% of the driving population and submitted records on over 1.7 million accidents involving two or more vehicles. This study subdivides the accident involved driver classes (age-sex) into two groups: the responsible and the not responsible. By analyzing the not responsible group a measure of relative exposure is obtained while the analysis of the responsible group yielded an indicative measure of the risk associated with each driver class.

Search terms: Accident risk forecasting; Accident responsibility; Mathematical models; Accident analysis; Driver age; Driver sex; Liability; Environmental factors; Time of accidents; Day of week; Urban accidents; Rural accidents; Accident records; Day vs night accident risks; Accident risks; Equations

AVAILABILITY: NHTSA

1/4 Locations

HS-012 258 Fld. 1/4; 3/11; 2/9

PEDESTRIAN CROSSWALK STUDY: ACCIDENTS IN PAINTED AND UNPAINTED CROSSWALKS

by B. F. Herms

Published in *Highway Research Record* n406 p1-13 (1972)

1972 15refs

Sponsored by California Office of Traf. Safety and National Hwy. Safety Bureau.

Accident experience covering a five-year period was studied at 400 unsignallized intersections each having one marked and one unmarked crosswalk crossing the main thoroughfare. In addition, pedestrian and vehicle traffic characteristics were studied to determine the pedestrian's relative use of marked and unmarked crosswalks and his exposure to vehicular traffic. The results show that during the five year period 177 pedestrians were hit in the 400 marked crosswalks compared with 31 pedestrians hit in the 400 unmarked crosswalks. In terms of the number of pedestrians using the crosswalks, approximately twice as many pedestrian accidents occur in marked crosswalks as in unmarked crosswalks. Evidence indicates that the poor accident record of marked crosswalks is not due to the crosswalk being marked as much as it is a reflection on the pedestrian's attitude and lack of caution when using the marked crosswalk. Recommendations include a pedestrian education program and limiting crosswalks to only those locations where warranted.

Search terms: Pedestrian accidents; Crosswalks; Crosswalk markings; Pedestrian fatalities; Pedestrian behavior; Accident statistics; Pedestrian age; Time of accidents; Traffic surveys; Accident studies; Uncontrolled intersections; Accident location

HS-012 290 Fld. 1/4

ASSEMBLY AND USE OF ACCIDENT DATA

by D. M. Baldwin

~~Federal Hwy.~~ Administration, F06000

1/4 Locations (Cont'd.)

HS-012 290 (Cont'd.)

Published in *Highway Research Record* n376 p14-7 (1971)

1971 6refs

Sponsored by Highway Res. Board Steering Com. for Workshop on Anti-Skid Program Management and presented at the workshop.

The use of accident records as a predictor of future accident occurrence and therefore as an indicator of necessary remedial action is an accepted approach in the highway safety field. In many areas, unfortunately, the technique has not been used systematically. Four key elements are essential in terms of an anti-skid program based on analysis of accident records: accidents that result in more than a specified amount of damage should be reported; location information system that is capable of pinpointing accidents within one-tenth of mile should be established; environmental information concerning each accident should be reported to permit identification of accidents caused by skidding; and a storage and retrieval system that will provide quick and automatic notice of concentrations of skidding accidents at points or on sections should be established. If these four prerequisites are met, the foundation exists for an anti-skid program that is soundly based on accident experience.

Search terms: Accident records; Accident location; Accident risk forecasting; Highway safety programs; Skidding accidents; Wet road conditions

HS-012 306 Fld. 1/4; 2/4

USE OF ACCIDENT DATA TO IDENTIFY WET-PAVEMENT LOCATIONS IN PENNSYLVANIA

by E. R. Ricker

Published in *Highway Research Record* n376 p18-20 (1971)

1971

Sponsored by Highway Res. Board Steering Com. for Workshop on Anti-Skid Program Management and presented at the workshop.

Accident reports are analyzed and coded for data processing. Coded information includes accident record number; location; date; weather; road surface condition; accident type; identification of offending vehicle by type, movement, and causation factors; identification of other vehicles involved; and severity of accident. The various printouts of wet pavement accidents are studied, and a list of highway sections to be skid-tested is prepared for each engineering district. Two skid trailers are used in the statewide testing program. The program for correcting pavement surfaces with low skid numbers based on accident studies has not been in operation long enough to allow for after studies of accidents, although these are obviously desirable. It is anticipated that the 1971 accident records will provide a basis for this comparison.

Search terms: Accident location; Pennsylvania; Wet road conditions; Accident records; Electronic accident analysis; Skid resistance tests; Accident risk forecasting; Pavement skidding characteristics; Skidding accidents

1/5 Statistical data

HS-012 280 Fld. 1/5

ACCIDENT FACTS, 1972 ED.

National Safety Council, N25800

1972 99p

Detailed statistics are presented for all types of accidents including motor vehicle accidents and those occurring in public places, at work, at home, on the farm, and at school.

Search terms: Accident statistics; Accident types; Vehicle accidents; Accident costs; Injury statistics; Industrial accidents; Home accidents; Fatalities by age; Fatality causes; Fatality rates; Fatalities by sex; Accident causes; Annual reports; Disasters; Injury causes; Pedestrian accidents; Accident factors; Driver characteristics; Pedestrian injuries; Injury rates; Accident compensation; Accident rates; Pedestrian fatalities; Bicycle accidents; Urban accidents; Rural accidents; Day vs night accidents; Age factor in accidents; Sex factor in accidents; Accident location; School accidents; Farm accidents; Recreational accidents

AVAILABILITY:
Corporate author $2.65 as Stock no. 021.52

HS-012 291 Fld. 1/5; 3/4

ACCIDENT INVOLVEMENT OF YOUNG DRIVERS IN SUFFOLK COUNTY

Suffolk County Traf. Safety Board, N.Y., S50200

1972 14p

A review of accident records was made for the 5-year period 1966 through 1970 inclusive. Drivers under 25 were 17.6% of the driver population but were involved in 33.1% of the accidents. From the data presented it is evident that in Suffolk County there is an inordinate involvement of young drivers in traffic accidents both in terms of their proportion of the driving population and their proportion of mileage driven. Young drivers are highly involved among motor vehicle operators killed in accidents and in those fatal accidents in which alcohol was a factor. This group of drivers received over 50% of the misdemeanor traffic citations and over 40% of the citations for traffic infractions. A program for mandatory, state-wide driver education as a prerequisite to obtaining a driving license is recommended.

Search terms: Accident rates; Adolescent drivers; Young adult drivers; Driver mileage; Driver age; Driver fatalities; Drinking drivers; Traffic law violations; Driver education; Traffic law violators; New York (State); Accident studies

2/0 HIGHWAY SAFETY

2/2 Communications

HS-012 263 Fld. 2/2

MEASURING THE EFFECTIVENESS OF A VOLUNTEER EMERGENCY-MONITORING SYSTEM CITIZENS RADIO SERVICE

by R. M. Chiaramonte; H. B. Kreer

Published in *Highway Research Record* n402 p16-27 (1972)

1972 11refs

Sponsored by Highway Res. Board Com. on Communications and Com. on Motorist Services.

The experimental statewide emergency communications network utilizing the Citizens Radio Service conducted in Ohio during 1970-1971 is described. The program known as the Ohio REACT (Radio Emergency Associated Citizens' Teams) Emergency Network was established as an experimental 2 year program to test the effectiveness of volunteer citizens monitoring emergency communications and providing assistance to motorists. Data gathered in the program's first year of operation and goals established for the second year are presented. The program demonstrated that two-way communications effectively provide the motorist with a means of communicating his problem in depth. It permits the helper, be he professional or volunteer, to determine the correct course of action to aid the motorist and report back to the motorist.

Search terms: Citizens band radios; Ohio; Emergency reporting systems; Radio communications; Driver aid systems

HS-012 264 Fld. 2/2

A HIGHWAY COMMUNICATION SYSTEM FOR THE MOTORIST: THE CASE FOR TWO-WAY RADIO

by C. E. Quinn

Published in *Highway Research Record* n402 p9-15 (1972)

1972 11refs

Sponsored by Highway Res. Board Com. on Communications.

Communications systems currently in operation and those proposed for stranded motorists are briefly reviewed. The volunteer two-way mobile voice radio system that has been developing in the U. S. in the 27 MHz Citizen's Radio Service is discussed. A highway communication radio service set up by federal agencies is proposed. The principal intent of this service is for aid to the motorist and for contact with him by highway, law enforcement, and other public service agencies. It is suggested that this service be implemented on an interim basis in the 26 to 30 MHz band using voice communication and readily available, inexpensive transceivers for communication on the emergency channel 9 of the CRS and on a minimum of five adjacent channels. In conclusion, recommendations are made for the development of the hardware and implementation of the radio systems.

Search terms: Radio communication; Citizens band radios; Driver aid systems; Emergency reporting systems; Driver to driver communications

HS-012 265 Fld. 2/2

EVALUATION OF THE FIRST FLASH INSTALLATION

by B. Adler; I. S. Wisepart; R. H. Emery

Published in *Highway Research Record* n402 p28-36 (1972)

1972 4refs

Sponsored by Highway Res. Board Com. on Motorist Services.

Flash Lights And Send Help (FLASH) is an electronic system that was installed on a 50-mile section of Interstate 4 in Florida to test the operational feasibility of cooperative motorists using their headlights to summon aid for distressed motorists. The evaluation program proved FLASH to be an effective motorist aid system. Effectiveness measures included empirical data from a series of controlled experiments which showed that an operationally acceptable fraction (better than 12%) of passing motorists used the system properly. About 0.1% responded incorrectly, which is more than ample discrimination. Motorist acceptance and understanding of FLASH were determined from mail-back questionnaires. During the evaluation period, design improvements were made. Changes include an improved communications system (frequency shift keyed) and more stable photodetectors. FLASH has proved to be the most economical and effective system for the detection and location of stranded motorists.

Search terms: Flash Lights and Send Help Program; Florida; Program evaluation; Questionnaires; Disabled vehicles; Electronic monitoring systems; Photodetectors; Driver aid systems

2/4 Design and Construction

HS-012 288 Fld. 2/4; 2/6; 4/2

PROBLEMS ASSOCIATED WITH ANTI-SKID PROGRAM MANAGEMENT

by E. A. Whitehurst

Ohio State Univ., 005400

Published in *Highway Research Record* n376 p7-13 (1971)

2/4 Design and Construction (Cont'd.)

HS-012 288 (Cont'd.)

1971 16refs

Sponsored by the Highway Res. Board Steering Committee for Workshop on Anti-Skid Program Management and presented at the workshop.

The highway engineer or administrator must: gain public support for an anti-skid program; determine the level of skid resistance that should be maintained on various elements of the highway system; decide how the desirable or existing values of skid resistance shall be measured and evaluated; decide on a measurement program that will involve evaluation of specific locations; determine applicable treatment for each surface found to be inadequate; be concerned with new construction to see that the geometric design employed in construction provides adequate and durable skid resistance; and maintain an interest and awareness in those areas that are not under his immediate jurisdiction, particularly the areas of tire design and construction and driver education.

Search terms: Highway safety programs; Pavement skid resistance; Pavement friction; Wet road conditions; Public information programs; Pavement surface texture; Tire pavement interface; Tire traction; Highway maintenance

HS-012 293 Fld. 2/4

VEHICLE IMPACT TESTS ON THE TENSIONED-BEAM AND OPEN BOX CRASH BARRIERS

by V. J. Jehu; L. C. Pearson

Transport and Road Res. Lab. (England). T33900

1972 25p 2refs
Report no. TRRL-LR-502

Two basic designs of vehicle barriers have been developed in which steel guardrails are attached to knock-down steel posts by means of shear bolts. The tensioned-beam barrier uses conventional W-section guardrail and the open box barrier uses a stiffer guardrail. Both satisfactorily contained and redirected cars weighing about 1400 kg. striking at 100-110 km/h and at 20° to the line of the barriers. Maximum wheel penetrations were 0.92 m for the W-section barrier and 0.6 m for the open box barrier. Tests on a double rail open box barrier are also described.

Search terms: Guardrail impact tests; Guardrail design; Barrier deformation; Impact velocity; Impact angle; Breakaway structures; Deceleration; Barrier collision tests; Guardrail posts; Barrier impact forces; Rebound

HS-012 321 Fld. 2/4

HIGHWAY SAFETY REQUIRES SAFE HIGHWAYS

by H. E. Campbell

Published in *Rocky Mountain Medical Journal* v67 n8 p64-6 (Aug 1970)

1970 8refs

The General Motors Proving Ground is contrasted with typical highway design. Widths of medians and shoulders, guardrail location, fixed obstacles, and intersections are discussed. It is recommended that two-lane roads be converted to one-way roads.

Search terms: Highway design; Median crossover collisions; Roadside hazards; Guardrails; Median width; Divided highways; Road shoulder width; Proving grounds; Injury prevention

2/7 Meteorological Conditions

HS-012 270 Fld. 2/7; 5/22; 5/18

A STUDY OF VARIABLES ASSOCIATED WITH WHEEL SPIN-DOWN AND HYDROPLANING

by J. E. Martinez; J. M. Lewis; A. J. Stocker

Published in *Highway Research Record* n396 p33-44 (1972)

1972 8refs

Sponsored by the Highway Res. Board Com. on Surface Properties-Vehicle Interaction, Texas Hwy. Dept., and the Federal Hwy. Administration.

This report evaluates wet-weather properties of a portland cement concrete pavement and a bituminous surface and considers the effects of water depth, tire inflation pressure, tire tread depth, and wheel load. The study was performed by conducting full-scale tests on a hydroplaning trough 800 ft. long, 30 in. wide, and 4 in. deep. Water depths up to 0.8 in. can be maintained in the trough. It can be concluded that loss of traction occurs as soon as the wheel of a vehicle comes in contact with a flooded pavement. If the flooded portion of pavement is not long and the vehicle is not subjected to abnormal maneuvers, the tractive force can probably be regained without a hazardous condition existing. For a given vehicular ground speed that is high enough to cause wheel spin-down, the possibility of a hazardous condition existing increases with increasing length of flooded pavement. It is suggested that a reduction of speed to 50 mph be considered on any section of highway where water can accumulate to depths of 0.1 in. or more during wet periods.

Search terms: Hydroplaning; Wet road conditions; Water depth; Tire inflation pressure; Tire loads; Wheel spinning; Tire pavement interface; Bituminous concrete pavements; Portland cements; Speed limits; Tire tread depths; Instrumented vehicles; Tire traction; Pavement surface texture; Test facilities; Critical velocity

2/9 Traffic Control

HS-012 268 Fld. 2/9

CRITERIA FOR NO-PASSING ZONES

by G. W. Van Valkenburg; H. L. Michael

Published in *Highway Research Record* n366 p1-19 (1971)

1971 21refs

Sponsored by the Highway Research Board Committee on Traffic Control Devices and presented at the 50th annual meeting.

Traffic laws that prohibit driving on the left side of an applicable yellow line throughout the length of a no-passing zone constitute what is known as the short-zone concept. An alternative to this is the long-zone concept, which prohibits the beginning of a passing maneuver within a no-passing zone. Most states have laws that incorporate the short-zone concept. The purpose of this study was to determine which concept should be adopted to ensure maximum safety and comfort for the motoring public and to determine appropriate criteria and legislation to implement the recommended concept. The results of the research indicate that the long-zone concept, which legally allows the completion of a passing maneuver within a no-passing zone, should be adopted. Criteria for marking no-passing zones and a model law required to implement the concept were developed.

Search terms: No passing zones; Two lane roads; Sight distances; Speed patterns; Statistical analysis; Passing; Traffic law violations; Rural highways; Centerline markings; Passing zone markings; Traffic law uniformity; Variance analysis; Confidence intervals

HS-012 297 Fld. 2/9

AN ANALYSIS OF VEHICLE BREAKDOWNS IN THE MERSEY TUNNEL

by R. S. Bartlett; S. R. Chhotu

Transport and Road Res. Lab. (England), T33900

1972 27p 7refs
Report no. TRRL-LR-484

The report analyzes the records of vehicle breakdowns for the Mersey No. 1 Tunnel for the year beginning 1 April 1969. The parameters considered are breakdown frequency, cause, duration, and vehicle type. The breakdown rate in this tunnel was very similar to that in other road tunnels and major surface roads in Great Britain. The overall breakdown rate found was one per 22,500 vehicle-km. and their average duration was about 6 1/2 minutes; 1.3% of broken-down vehicles remained in the tunnel for at least 30 minutes. Data on vehicle breakdowns, in particular their frequency and duration, provide a basis for deciding on the emergency facilities needed for future road tunnels; the information would also be applicable to other urban motorways.

Search terms: Disabled vehicles; Traffic impedances; Tunnel traffic flow; Vehicle characteristics; Emergency road services; Traffic surveillance; Month; England; Vehicle mileage; Failures; Statistical analysis; Time factors

HS-012 317 Fld. 2/9; 4/7

VEHICLE OPERATIONS SURVEY. FINAL REPORT. VOL. 1.

Scott Res. Labs., S11400

1971 153p 10refs
Report no. SRL-2922-13-1271; PB-210 640

The purpose of the program was to define, determine, and typify automobile driving patterns in terms of operating modes. Data were collected in five major metropolitan areas and subsequently combined to form an overall composite of urban driving patterns. The data were processed to identify and summarize the basic vehicle operating modes: acceleration, deceleration, cruise, and idle. Mode characteristics such as frequency of occurrence, total duration, average duration, and transition probability were defined in matrix form. Supplementary information was obtained on average trip speed, acceleration-deceleration profiles, and manifold vacuum rates at various cruise conditions. Evaluation measures were defined to determine driving pattern similarities between cities and variability within a city. Merging of data from Los Angeles, Houston, Cincinnati, Chicago, and New York City yielded an overall composite of vehicle operation.

Search terms: Traffic flow; Automobile usage; Deceleration; Speed studies; Acceleration; Correlation analysis; Data acquisition; Idling; Matrix reduction; Instrumented vehicles; Route preferences; Trip distribution models; Los Angeles; Houston; Cincinnati; Chicago; New York (City); Traffic surveys; Trip length; Time of day; Cruising

AVAILABILITY: NTIS

3/0 HUMAN FACTORS

3/1 Alcohol

HS-800 565 Fld. 3/1

PRELIMINARY OPERATIONAL REQUIREMENTS AND ACCEPTABILITY CRITERIA FOR THE COOPERATIVE BREATH ANALYZER

by J. F. Oates, Jr.; H. H. Jacobs

Dunlap and Associates, Inc., D31800

1971 27p
Contract DOT-TSC-251
Report no. ED-71-30; DOT-TSC-251-1

The analyzer is expected to find a great deal of use as a field screening device. However, for the analyzer to prove useful for evidential purposes, its configuration faces significant modification, and it must be compatible with a number of procedural requirements. These factors do not arise from engineering deficiencies, but are related to points of

3/1 Alcohol (Cont'd.)

HS-800 565 (Cont'd.)

protocol imposed by the judicial system upon devices used to gather evidence.

Search terms: Breathalyzers; Alcohol breath tests; Legal factors; Evidence; Calibration

AVAILABILITY: NTIS

HS-800 705 Fld. 3/1

ALCOHOL AND ALCOHOL SAFETY. A CURRICULUM MANUAL FOR SENIOR HIGH LEVEL. VOL. 1

by P. Finn; J. Platt

Abt Associates, Inc., A04299

1972 316p refs
Contract HSM-42-71-77

This manual is designed to provide high school teachers, school departments, and workshops with all the traffic safety and related alcohol education objectives and classroom activities necessary to develop a comprehensive curriculum designed to promote responsible use of alcohol vis-a-vis traffic and pedestrian safety. In addition, a complete seven week curriculum outline on traffic safety is included.

Search terms: Alcohol education; Alcohol education materials; Manuals; Curricula; Alcohol effects; Alcoholism; Alcohol laws; Alcohol usage; High schools

AVAILABILITY: GPO

HS-800 706 Fld. 3/1

ALCOHOL AND ALCOHOL SAFETY. A CURRICULUM MANUAL FOR SENIOR HIGH LEVEL. VOL. 2. A TEACHER'S ACTIVITIES GUIDE

by P. Finn; J. Platt

Abt Associates, Inc., A04299

1972 259p
Contract HSM-42-71-77

Classroom activities for high school students, which can be implemented in conjunction with an alcohol education program, are presented. Each activity provided is a self-contained learning experience which requires varying numbers of class periods and focuses on one or more objectives. These activities are arranged by alcohol topic areas including safety, attitudes and reasons for drinking, physical and behavioral effects, industry, interpersonal relationships, law and custom, and problem drinking and alcoholism.

Search terms: Alcohol education; Alcohol education materials; Manuals; Curricula; High schools; Alcohol effects; Alcoholism; Alcohol usage

AVAILABILITY: GPO

HS-800 707 Fld. 3/1

ALCOHOL AND ALCOHOL SAFETY. A CURRICULUM MANUAL FOR ELEMENTARY LEVEL. VOL. 1

by P. Finn; J. Platt

Abt Associates, Inc., A04299

1972 285p refs
Contract HSM-42-71-77

This manual is designed to provide elementary teachers, school departments, and workshops with all the traffic safety and related alcohol education objectives and classroom activities necessary to develop a comprehensive curriculum designed to promote responsible use of alcohol vis-a-vis traffic and pedestrian safety. In addition, a complete seven-week curriculum outline on traffic safety is included.

Search terms: Alcohol education; Alcohol education materials; Manuals; Curricula; Alcohol effects; Alcohol usage; Alcoholism; Alcohol laws; Child safety education

AVAILABILITY: GPO

HS-800 708 Fld. 3/1

ALCOHOL AND ALCOHOL SAFETY. A CURRICULUM MANUAL FOR ELEMENTARY LEVEL. VOL. 2. A TEACHER'S ACTIVITIES GUIDE

by P. Finn; J. Platt

Abt. Associates, Inc., A04299

1972 122p
Contract HSM-42-71-77

Classroom activities for elementary school students, which can be implemented in conjunction with an alcohol education program, are presented. Each activity provided is a self-contained learning experience which requires varying numbers of class periods and focuses on one or more objectives. These activities are arranged by alcohol topic areas including safety, attitudes and reasons for drinking, effects, industry, and interpersonal relationships.

Search terms: Alcohol education; Alcohol education materials; Manuals; Curricula; Alcohol effects; Child safety education

AVAILABILITY: GPO

HS-800 709 Fld. 3/1

ALCOHOL AND ALCOHOL SAFETY. A CURRICULUM MANUAL FOR JUNIOR HIGH LEVEL. VOL. 1

by P. Finn; J. Platt

Abt Associates, Inc., A04299

1972 299p refs
Contract HSM-42-71-77

This manual is designed to provide junior high school teachers, school departments, and workshops with all the traffic safety and related alcohol education objectives and classroom activities necessary to develop a comprehensive curriculum designed to promote responsible use of alcohol vis-a-vis traffic and pedestrian safety. In addition, a complete seven-week curriculum outline on traffic safety is included.

Search terms: Alcohol education; Alcohol education materials; Curricula; Manuals; Alcohol effects; Alcohol usage; Alcoholism; Alcohol laws; Child safety education

AVAILABILITY: GPO

HS-800 710 Fld. 3/1

ALCOHOL AND ALCOHOL SAFETY. A CURRICULUM MANUAL FOR JUNIOR HIGH LEVEL. VOL. 2. A TEACHER'S ACTIVITIES GUIDE

by P. Finn; J. Platt

Abt Associates, Inc., A04299

1972 251p
Contract HSM-42-71-77

Classroom activities for junior high school students which can be implemented in conjunction with an alcohol education program are presented. Each activity provided is a self-contained learning experience which requires varying numbers of class periods and focuses on one or more objectives. These activities are arranged by alcohol topic areas including safety, attitudes and reasons for drinking, physical and behavioral effects, industry, interpersonal relationships, law and custom, and problem drinking and alcoholism.

Search terms: Alcohol education; Alcohol education materials; Manuals; Curricula; Child safety education; Alcohol effects; Alcoholism; Alcohol usage

AVAILABILITY: GPO

HS-800 726 Fld. 3/1

SUMMARY OF WORK PERFORMED PURSUANT TO THE DEVELOPMENT OF K-12 ALCOHOL AND ALCOHOL SAFETY CURRICULUM MATERIALS. FINAL REPORT

Abt Associates, Inc., A04299

1972 25p
Contract HSM-42-71-77

This report describes the initial literature search for alcohol and alcohol safety curriculum materials and content literature; an alcohol curriculum development workshop for students, teachers, parents, and administrators; and the actual development of three manuals for use in grades kindergarten-6, 7-9, and 10-12.

Search terms: Alcohol education materials; Curricula; Child safety education

AVAILABILITY: NTIS

HS-800 741 Fld. 3/1

NEW HOPE—NEW POSSIBILITIES. A REPORT TO THE RELIGIOUS COMMUNITIES ON THE ALCOHOL SAFETY ACTION PROJECTS (ASAP)

by J. Soleau; D. A. Works

North Conway Inst., N67000

1972 30p
Contract HS-184-2-289

Title page reads: New Hope—New Responsibilities.

The seriousness of the drinking driver problem is described. The effects of alcohol on driving ability, the ways in which blood alcohol concentrations are determined, and the ways in which alcohol leaves the body are described. New possibilities for control of the drinking driver problem are discussed. Under the Highway Safety Act of 1966, a countermeasures program was begun, including public information and education, equal enforcement, pre-sentence investigation, treatment and rehabilitation, and Alcohol Safety Action Projects. Ways in which religious groups can support alcohol countermeasure programs include upgrading state laws, educational efforts, pastoral care and support of the convicted and their families, providing meeting space in church buildings, teaching of sane alcohol use as a religious conviction, and informed constructive criticism.

Search terms: Drinking drivers; Alcohol education; Alcohol Safety Action Projects; Blood alcohol levels; Alcohol usage deterrents; Community support; Alcohol effects; Problem drivers; Alcoholism; Driver rehabilitation; Alcohol laws; Accident causes; Clergy; Highway Safety Act of 1966; Alcohol usage; Psychological factors; Sociological factors

AVAILABILITY: NTIS

3/2 Anthropomorphic Data

HS-012 302 Fld. 3/2; 4/5; 5/14

MODIFIED ROS OCCUPANT DYNAMICS SIMULATION USER MANUAL

by J. P. Danforth; C. D. Randall

General Motors Corp., G06600

1972 327p
Report no. GMR-1254

Prepared for use of Motor Vehicle Manufacturers Assoc., Inc.

3/2 Anthropomorphic Data (Cont'd.)

HS-012 302 (Cont'd.)

This manual is intended for use with Cornell Aeronautical Laboratory's Modified Revised Occupant Simulation, Two-Dimensional Occupant Dynamics Simulation. It includes a general description of program modifications which provide for greater user convenience, more comprehensive output of computed data, and a more flexible treatment of vehicle interior target surface loading, unloading, and reloading characteristics. Input data formats and descriptions are given in detail. Modifications to the variable list are presented. A sample input and abbreviated output are included, together with a complete source program listing.

Search terms: Occupant kinetics; Human body simulation; Computerized simulation; Occupant modeling; Occupant vehicle interface; Computer programs; Automobile interior models; Simulation models; Occupant protection; Parameters; Accident simulation; FORTRAN; Data processing; Impact forces

3/4 Driver Behavior

HS-012 269 Fld. 3/4

DRIVER INFORMATION NEEDS

by T. M. Allen; H. Lunenfeld; G. J. Alexander

Published in *Highway Research Record* n366 p102-15 (1971)

1971 36refs

Sponsored by the Highway Research Board Committee on Motorist Information Systems and presented at the 50th annual meeting.

The driving task was analyzed to determine the nature and interrelationship of the subtasks the driver performs and the information needed to perform them safely and efficiently. The task analysis provided the basis for categorizing the various component driving subtasks, identifying information needs associated with the subtasks and their present methods of satisfaction, and providing a structure to the driving task. Driving subtasks were categorized in accordance with information-decision-action complexity and ordered along a continuum. The subtasks were found to fall along a hierarchical scale. Vehicle control subtasks such as steering and speed control were ordered at the lowest level and identified as micro-performance (control). At an intermediate level, subtasks associated with response to road and traffic situations were identified as situational performance (guidance). The highest level subtasks, encompassing trip planning and preparation and route finding, were identified as macro-performance (navigation).

Search terms: Driving task analysis; Driver skills; Driver performance; Attention; Vehicle control; Vehicle handling; Speed control; Vehicle guidance; Loading (operator performance); Information seeking

HS-012 274 Fld. 3/4; 2/9

THE EFFECTS OF INTERSECTION TRAFFIC CONTROLS UPON LEFT TURN-SIGNALLING BEHAVIOR

by S. R. Fewell

Texas A and M Univ., T16800

1970 36p 28refs
Report no. AD-738 999

Master's thesis. Sponsored by U. S. Army Materiel Command Intern Training Center.

Two-way stop, four-way stop, and signal controlled intersections were selected for comparison of their effects upon the frequency of use and the distance of employment of left turn signals. Observations of signalling behavior were made at 25 intersections. Analysis of the field data indicated: signal controlled intersections elicit a significantly greater signalling frequency than do two-way stop and four-way stop intersections; two-way stop and four-way stop intersections do not differ significantly in their effects upon signalling frequencies of left turns; no significant difference exists among the effects of the three types of intersections upon the distance at which drivers initially signal their intention to turn left; the mean signalling distances of the three types of intersections were significantly less than the standard distance of 100 feet prescribed by the Texas motor vehicle laws.

Search terms: Driver behavior research; Signal usage; Left turn signals; Four way stop intersections; Signalized intersections; Two way stop intersections; Texas; Traffic laws; Left turns; Stop signs; Variance analysis; Chi square tests; Traffic signal effectiveness

AVAILABILITY: NTIS

HS-012 282 Fld. 3/4; 3/12

VISUAL SEARCH BY AUTOMOBILE DRIVERS

by G. H. Robinson; D. J. Erickson; G. L. Thurston; R. L. Clark

Published in *Human Factors* v14 n4 p315-23 (Aug 1972)

1972 14refs
Grant PHS-UI00066

Data are presented on the visual search of automobile drivers during two maneuvers: entering a highway after a stop, and changing lanes on a multilane highway. Head movement measurements were used to infer patterns and timing of search. The relationships between eye and head movements are discussed. Individual visual search times in the stop and enter experiment ranged from 1.1 to

2.6 sec. In the lane change experiment they ranged from 0.8 to 1.6 sec. for the mirrors and 0.8 to 1.0 sec. for search back (including movement times). It appears that increased complexity of the visual input task leads primarily to more visual searches, and, to a lesser extent, to longer individual searches.

Search terms: Driving task analysis; Visual behavior; Search performance; Driver monitoring; Head movement; Eye movements; Lane changing; Left turns; Right turns; Instrumented vehicles; Time factors

HS-012 319 Fld. 3/4

ADOLESCENT DRIVING AS DEVIANT BEHAVIOR

by D. Klein

Published in *Journal of Safety Research* v4 n3 p98-105 (Sep 1972)

1972 12refs

When adolescent driving is recognized as almost inevitably deviant because of the adolescent's social situation, one can understand why current punitive and educational measures are unlikely to be effective in reducing citation and crash frequency. Our society might be able to reallocate substantial resources to more effective countermeasures if it could recognize that adolescent driving is an integral part of the adolescent subculture and that it should not be evaluated by adult standards.

Search terms: Adolescent drivers; Sociological factors; Adolescent conduct codes; Driver social class; Automobile cultural role; Driver attitudes; Driver behavior

3/5 Driver Education

HS-840 019 Fld. 3/5

AN EVALUATIVE STUDY OF CURRICULUM MATERIALS

MEASURING STUDENTS' KNOWLEDGE OF TRAFFIC LAWS AND REGULATIONS

Illinois Univ., I14400

1971 62p 32refs

Prepared for Office of Superintendent of Public Instruction, Safety Education Unit, Springfield, Ill.

This study was designed to evaluate the effectiveness of the new Driver Education Instructional Program in meeting the following objective: the students are able to define traffic regulations and their requirements and recognize the various situations or conditions under which they apply. One group of high school driver education students used Unit 2 of the new instructional program, Traffic Laws and Rules for Driver Performance; another group used a similar unit from a traditional program; a third group used a combination of both. Subjects were tested with a thirty-five item multiple choice type test, at the beginning of the unit and again at the unit's completion. Significant gains were achieved within each group, and no significant differences between groups were found.

Search terms: Driver education evaluation; High school driving courses; Instruction materials; Curricula; Classroom driver instruction; Illinois; Traffic laws; Variance analysis; Driver tests; Driving task analysis

3/8 Environment Effects

HS-012 276 Fld. 3/8

A STUDY OF THE EFFECTS OF ILLUMINATION AND NOISE ON SIMPLE MOTOR PERFORMANCE

by C. A. Gardinier

Texas A and M Univ., T16800

1971 34p 17refs
Report no. AD-739 474

Master's thesis. Sponsored by U. S. Army Materiel Command Intern Training Center.

In this study, 12 subjects performed a manual task under four conditions of illumination and noise. The results showed that a low level of illumination will produce a decrement in performance, a constant, broad-band, random noise will not have an effect on performance, and the interaction of illumination and noise will not have an effect. The conclusions are limited by the levels of the parameters which were selected.

Search terms: Lighting; Noise tolerances; Motor skills; Manual performance; Noise exposure; Laboratory tests; Variance analysis; Brightness; Tolerances (physiology); Environmental factors

AVAILABILITY: NTIS

3/11 Pedestrians

HS-012 259 Fld. 3/11; 4/8

PEDESTRIAN TRAVEL CHARACTERISTICS

by G. E. Maring

Published in *Highway Research Record* n406 p14-20 (1972)

1972 2refs

A survey of pedestrian trips was conducted in Washington, D. C., and supplemented by data from the Nationwide Personal Transportation Study. The major purpose of the Washington survey was to analyze data on walking trip lengths as a function of age, sex, trip purpose, and day of week for use in transportation and community planning. Results of the survey show that 90% of the walking trips were less than one mile. The median walking trip length was 1,600 ft. Men generally made longer walking trips than women. Differences in trip length distributions by age group were not clear. Trip lengths were the

3/11 Pedestrians (Cont'd.)

HS-012 259 (Cont'd.)

longest for the trip to work. The study showed shorter trip lengths for the work trip, with almost 71% less than one half mile. Nationwide, 5% reported walking as the usual method of getting from home to work. There was a higher proportion of persons with incomes under $4,000 walking to work than in those income groups over $10,000. The youngest and oldest working age groups reported higher than average walking to work.

Search terms: Pedestrian age; Pedestrian sex; Trip length; Trip purpose; Day of week; Transportation studies; Walking distance; Commuting patterns; District of Columbia; Pedestrian characteristics

HS-012 260 Fld. 3/11; 4/8

PEDWAYS VERSUS HIGHWAYS: THE PEDESTRIAN'S RIGHTS TO URBAN SPACE

by J. J. Fruin

Published in *Highway Research Record* n406 p28-36 (1972)

1972 19refs

The advent of machine transportation has changed the perspectives of city planning, forcing man into an unbalanced competition for urban space. The street and building spaces of the urban core of the typical central business district (CBD) magnify this problem because of their intensive concentration of pedestrians. The rectangular grid pattern of typical CBD is not conducive to the characteristically short pedestrian trips that occur there. A number of cities have recognized a need for a return to the human scale of the cities of the past, an increased awareness of the need for human interaction and communication, and realization of the importance of the human sense of belonging to, and relating with, the design environment. New developments in planned pedestrian environments in Toronto, Montreal, London, Cincinnati, and Minneapolis are discussed. Consideration of handicapped pedestrians in planning urban areas is also discussed.

Search terms: Urban planning; Central business districts; Malls; Pedestrian safety; Handicapped pedestrians; Sidewalks; Minneapolis; Cincinnati; Toronto; Montreal; London; History

4/0 OTHER SAFETY-RELATED AREAS

4/1 Codes and Laws

HS-012 289 Fld. 4/1; 2/7

SYNTHESIS OF CASE LAW JURISPRUDENCE RELATING TO WET-WEATHER HIGHWAY CONDITIONS

by D. C. Oliver

Published in *Highway Research Record* n376 p29-36 (1971)

1971

Sponsored by Highway Res. Board Steering Com. for Workshop on Anti-Skid Program Management and presented at the workshop.

The extant case law on legal liability for accidents occurring on icy and wet highways has established three central areas and one subarea in the jurisprudence of maintenance liability. These areas are compliance with general duties in order to escape liability; damages resulting from noncompliance (negligence); contributory negligence as a bar to recovery; and advisory signing as a technique in meeting general duties. Court decisions covering these four areas are presented.

Search terms: Liability; Negligence; Accident responsibility; Legal responsibility; Wet road conditions; Court decisions; State government; Skidding accidents; Warning signs; Highway maintenance; Litigation; Icy road conditions

4/5 Information Technology

HS-012 277 Fld. 4/5; 5/4

SMALL ENGINE DESIGN USING ADAPTIVE CONTROL DESIGN OPTIMIZATION TECHNIQUE

by E. J. Reynolds; J. J. Allan, 3rd

Texas Univ., T19800

1972 8p 6refs
Report no. SAE-720732

Presented at National Combined Farm Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

Advances in low cost digital computing have spawned new design techniques. One of these, design optimization by adaptive control, is explained. Modeling an entire system to optimize one component has many disadvantages. When using the ideas presented here, a component is removed from a physical system and replaced with a minicomputer, D/A and A/D hardware, transducers, and an adaptive simulation algorithm. The adaptive algorithm can then optimize the component design using real time performance data. An example implementation dealing with a small reciprocating internal combustion engine, and some possible future applications, are discussed.

Search terms: Computerized design; Algorithms; Internal combustion engines; Engine design; Air fuel ratio; Simulation models; Engine performance; Engine size; Reciprocating engines; Engine speeds

AVAILABILITY: SAE

5/0 VEHICLE SAFETY

5/1 Brake Systems

HS-012 286 Fld. 5/1

GOODRICH GOES ON-HIGHWAY WITH ANTI-SKID

by J. B. Pond

Published in *Automotive Industries* v147 n7 p29-34 (1 Oct 1972)

1972

B. F. Goodrich's triple action, skid control braking system for heavy vehicles is described. Rather than relying on a central computer, the system incorporates an individual computer-controlled valve/module assembly for each axle with braked wheels. The advantage of this arrangement is that everything can be contained within the housing to minimize external wiring and to simplify maintenance. When skid control action is demanded by digital signals from the skid control logic, pressure to the brakes is reduced, either partially or completely, depending upon the severity of the skid. The advantage of the system is that it senses the magnitude of the skid condition and responds through a double solenoid, three-step controlling relay valve.

Search terms: Skid control; Antiskid brakes; Air brakes; Wheel locking; Deceleration; Speed sensors; Computers; Solenoids; Heavy duty vehicles; Coefficient of friction; Automatic brakes; Brake controls; Antilocking devices; Brake system design

HS-012 292 Fld. 5/1

HYDROSTOP AND DOT STOP

by T. Grey

Published in *Road Test* v9 n1 p42-5, 90 (Jan 1973)

1973

Bendix Corporation's two new low-cost rear wheel and anti-skid braking systems, Hydrostop and Dot Stop, are described. The systems differ in basic design only in the source of power to modulate brake line pressure to prevent rear wheel lockup in hard braking, especially on slippery surfaces. Dot Stop uses vacuum from the car's intake manifold. Hydrostop relies on fluid under pressure from the auto's power steering pump. Costs for the systems should be between $50-$70 if demand results in a moderate manufacturing level and probably less in volume production. During tests on the two systems, when the rear wheels would normally lock on an ice-like surface, cycling of brake line pressure up and down began almost instantly. The back wheels therefore continued to roll and stops were virtually straight line. Continued rear wheel turning resulted in shorter stopping distances.

Search terms: Antiskid brakes; Wheel locking; Rear wheels; Safety device costs; Wet road conditions; Panic stops; Tire traction; Antilocking devices; Stopping distance; Pressure modulators; Skid pan tests; Skid control; Brake tests; Brake system design; Vacuum brakes; Hydraulic brakes; Brake performance; Modulating valves

5/2 Buses, School Buses, and Multipurpose Passenger Vehicles

HS-012 301 Fld. 5/2; 4/7

IMPACT BEHAVIOUR OF SMALL SCALE MODEL MOTOR COACHES

by W. T. Lowe; S. T. S. Al-Hassani; W. Johnson

Published in *Institution of Mechanical Engineers Proceedings* v186 n36/72 p409-19 (1972)

1972 10refs

Simplified small scale model motor coaches were designed and tested under both static and dynamic loading, and attempts are made to relate the results to a full scale collision. Two theoretical approaches for the modeling of a motor vehicle collision are discussed and generally developed using dimensionless analysis and a technique of relating the actual vehicle and models to tubular structures. A distinct difference in the nature of crumpling was found between static and dynamic loading. When statically loaded the models were found to buckle at any point along their lengths. When dynamically loaded the deformation was confined mainly to the impacted end of the models in the form of short-wave type wrinkles, and although some deformation was observed at the weak points of the structure, this was not as pronounced as in the static case.

Search terms: Impact tests; Loading tests; Dynamic loads; Static loads; Collision models; Scale models; Bus tests; Crush tests; Model tests; Structural deformation analysis; Mathematical models; Mathematical analysis; Correlation analysis

5/3 Cycles

HS-012 322 Fld. 5/3

BICYCLE USE AS A HIGHWAY SAFETY PROBLEM. SPECIAL STUDY

National Transp. Safety Board, N30000

1972 21p 22refs
Report no. NTSB-HSS-72-1; PB-210 025

In each of the past 3 years, 800 or more fatalities occurred in collisions between bicycles and motor cars, the majority of losses and injuries being among children 5 to 14 years old. No clearly feasible and effective countermeasures are readily at hand. Recommendations are made that NHTSA: explore and develop effective methods of integrating training of young people for bicycle operation and automobile driving, promulgate a highway safety program standard for bicycle safety, and coordinate its bicycle safety

HS-012 322 (Cont'd.)

efforts with the Department of Health, Education and Welfare (DHEW), particularly with respect to bicycle design. It is recommended that DHEW's research focus on injury potential of specific design features as well as operator behavior associated with specific features, and that the Federal Highway Administration and NHTSA be actively involved in the Department of Transportation's efforts to encourage the use of bicycles to assure that safety is given full consideration.

Search terms: Bicycle rider fatalities; Bicycle rider injuries; Bicycle rider age; Sex factor in accidents; Age factor in accidents; Child injuries; Bicycle handling; Bicycle safety; Bicycle accidents; Bicycle rider behavior; Bicycle characteristics; Vehicle bicycle collisions; Light conditions; Driver education

AVAILABILITY: NTIS

5/4 Design

HS-012 275 Fld. 5/4; 2/7

TRANSMISSION NOISE REDUCTION

by T. A. Dunlap; W. G. Halvorsen

Structural Dynamics Res. Corp., S48040

1972 7p 2refs
Report no. SAE-720735

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

This paper discusses the nature of noise production of automotive transmissions and the various measures which may be taken to reduce operating noise. The measures discussed include investigation and modification of the gearshaft system dynamics in both bending and torsion. Also discussed are determination of dynamic characteristics of the transmission housing and ways of reducing the levels of vibration of housing areas and of decreasing the radiation efficiency of those areas.

Search terms: Transmissions; Noise control; Gear teeth; Vibration control; Dynamic loads; Bending; Torsional vibration; Damping; Vehicle noise; Mathematical analysis; Planetary gear trains; Gears

AVAILABILITY: SAE

HS-012 281 Fld. 5/4

ROTARY BRUSH AIR CLEANER FOR GAS TURBINE ENGINES

by D. K. Werle; J. D. Stockham

IIT Res. Inst., I06000

1972 7p 9refs
Contract N00019-70-C-0256
Report no. SAE-720727

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

A parametric study was made of the variables associated with a rotary brush air cleaner for helicopter gas turbine engines. Tests were conducted at air volumes ranging 3,000-8,000 cubic feet/minute and brush speeds of 1,200-3,000 rpm. While centrifugal effects were found to be an important cleaning mechanism, impaction effects significantly improved dust separation at brush speeds above 2,400 rpm. On a constant impaction area basis, brushes with 1 mm. diameter wires were more efficient than brushes with 2 mm. wires. Wires added in the axial direction were more effective than wires added in a radial direction. Separation efficiency at 8,000 cubic feet/minute of dust laden air and brush speeds of 3,000 rpm approached 100% for size classified test dusts in the 15-35 micro-meter size range. The separation efficiency on a 2.7 micro-meter mass mean diameter test dust was a respectable 66%. Only 7 hp. was required to rotate the brush shaft at 3,000 rpm; the pressure drop of 4 in. of water was independent of brush speed.

Search terms: Air filters; Gas turbine engines; Dust collection; Helicopters; Air flow; Test facilities; Particle size; Wire brushes; Speed

AVAILABILITY: SAE

HS-012 296 Fld. 5/4; 5/14; 5/18; 5/1

TOWARDS SAFER ROAD VEHICLES, CONFERENCE HELD AT TRANSPORT AND ROAD RESEARCH LABORATORY, CROWTHORNE, ENGLAND, JANUARY 28, 1972. [PROCEEDINGS]

Transport and Road Res. Lab. (England), T33900

1972 160p 21refs
Report no. TRRL-LR-481

Co-sponsored by Society of Motor Manufacturers and Traders.

The proceedings present a comprehensive and up-to-date account of British work aimed at improving vehicle safety. Topics include the British approach to safer vehicles; vehicle features which might reduce the likelihood of accidents especially vehicle handling and anti-lock brake systems; and methods for the protection of vehicle occupants and of pedestrians. A brief description of the static displays and vehicle demonstrations presented at the conference is also included.

Search terms: Vehicle safety; Automobile safety characteristics; Vehicle handling; Instrument panel design; Automobile tests; Vehicle dynamics; Computerized test methods; Antilocking devices; Brake system design; Antiskid brakes; Occupant protection;

Human body impact tolerances; Human factors engineering; Impact tests; Seat belts; Air bag restraint systems; Computerized simulation; Pedestrian safety; Mathematical models; Occupant modeling; Automobile modeling; Equations of motion; Side impact collisions; Accident statistics; Great Britain; Injury severity; Barrier impact tests.

HS-012 300 Fld. 5/4

PRIMARY SAFETY: VEHICLE DESIGN TO AVOID ACCIDENTS

by R. H. Macmillan

Published in *Institution of Mechanical Engineers Proceedings* v186 n35/72 p479-90 (1972)

1972 95refs

Presented at Motor Show, London, 28 Oct 1971.

Vehicle safety characteristics are classified into four main areas: maximum information to driver; prevention of fatigue and error; satisfactory vehicle characteristics; and vehicle response to driver demands. Progress in each of these areas is discussed. Limitations on vehicle design which prevent the automobile designer from doing more than he can at present are technical–lack of knowledge or current capability; economic–solution known but too costly; styling–conflict with known or assumed customer preference; and legislation–conflict of national requirements.

Search terms: Automobile safety characteristics; Vehicle handling; Vehicle design; Safety design; Visibility; Vehicle lighting; Instrument panel design; Driver fatigue; Economic factors; Vehicle characteristics; Vehicle stability; Accident prevention; Consumer attitudes; Comfort; Ergosphere; Man machine systems; Driver vehicle interface; Driver errors; Human factors engineering; Glare reduction

HS-012 314 Fld. 5/4

ESV: SEARCH FOR THE SAFE CAR

Anonymous

Published in *Journal of American Insurance* v48 n4 p18-21 (Fall 1972)

1972

Results of impact tests with experimental safety vehicles designed by AMF, Fairchild, General Motors, and Ford Motor Co. are briefly discussed and some safety design features of these vehicles are mentioned. DOT safety vehicle specifications are also presented. Not only must the car protect lives at specified speeds for different types of impacts, it also must conform to certain handling characteristics. In addition, it should have improved driver visibility and conform to exhaust emission controls set by the government. The safety car must have a driving range of 250 miles at a cruise speed of 60 mph and the instrument panel must be engineered to avert misreading or unintentional activation of controls. Also the vehicle must withstand both front and rear collisions at 10 mph without any damage to the car.

Search terms: Safety cars; Barrier collision tests; Automobile costs; Automobile safety characteristics; Vehicle weight; Automobile design; Safety design; Crashworthiness; Experimental automobiles; Occupant protection

HS-800 688 Fld. 5/4; 4/7; 4/5

CAR-BARRIER IMPACT RESPONSE OF A COMPUTER SIMULATED MUSTANG. FINAL REPORT

by R. J. Melosh

Philco-Ford Corp., P16200

1972 91p 7refs
Contract DOT-HS-091-1-125; WDL-7101-C7

This report describes use of a computer program (CRASH) to direct simulation of a Mustang crashing head-on at 31 mph into a rigid barrier. The simulation produces time histories of deflections, velocities, accelerations, stresses, and strain rates of joints on truss and frame models of the car structure. It describes simple test problems selected to evaluate the ability of the simulation to represent transient, large deflection, and large strain phenomena. Illustrations of configuration descriptive data and printouts of computer results are included. The structural models are five to ten times stiffer than the real car when initial stiffness is matched; computer results exhibit the characteristics observed in physical tests. The ability to match only gross characteristics of response is attributed to the approximations made in modelling the utilized body as a truss. Despite the model inadequacy, the simulations yield general conclusions about car response and illustrate the ease of instrumentation, precise configuration control, and computer costs involved in car crash simulation.

Search terms: Computerized simulation; Collision models; Accident simulation; Mathematical models; Crash response forecasting; Nonlinear programming; Structural deformation analysis; Frames; Stiffness; Elasticity; Vehicle kinematics; Computer printouts; Strain rate; Deflection; Dynamic tests; Simulation models; Barrier impact forces; Barrier collision tests

AVAILABILITY: NTIS

HS-800 731 Fld. 5/4; 3/12

EQUIPMENT AND PROCEDURES FOR MEASURING GLARE FOR MOTOR VEHICLES. FINAL REPORT

by N. E. Chatterton; J. D. Hayes; E. W. George

Teledyne Brown Engineering, T09495

5/4 Design (Cont'd.)

HS-800 731 (Cont'd.)

1972 102p 16refs
Contract DOT-HS-089-1-139
Report no. DOT-SE-1576

A procedure and description of equipment for measuring glare from a driver's own vehicle are presented. The procedures are based on disability glare theory as applied to foveal vision. Two pieces of apparatus were constructed to provide the measurement capability. One of them simulates diffuse sky glare and the other simulates direct solar glare. Methods of combining data from these measurements are presented along with scaling laws selected to provide a value for glare as it would be under natural daylight conditions. A standard for allowable glare levels from the vehicle is developed which is independent of the measurement procedure. Test results from a passenger car are presented and compared with this standard. Recommendations for improvements to the apparatus and additional research requirements for improvement to the theory are made.

Search terms: Glare; Glare reduction; Visual perception; Photometers; Luminance; Hydraulic equipment; Central vision; Field of view; Backgrounds; Contrast; Light conditions; Brightness; Test facilities; Test equipment; Vehicle safety standards; Simulators: Light; Reflectance; Measuring instruments

AVAILABILITY: NTIS

5/6 Fuel Systems

HS-012 267 Fld. 5/6

THE REACTIVITIES OF GASOLINE VAPORS IN PHOTOCHEMICAL SMOG

by J. L. Laity; J. B. Maynard

Published in *Journal of the Air Pollution Control Association* v22 n2 p100-7 (Feb 1972)

1972 27refs

Presented at the Air Pollution Control Assoc. 64th annual meeting, Atlantic City, as paper 71-73.

Eight gasolines were analyzed to study the smog-forming tendencies of gasoline vapors. The study evaluates the methods commonly used to predict the reactivity of a mixture on the basis of its composition. The results indicate which compounds in gasolines can be responsible for the various symptoms of smog formation from evaporative losses. The results confirmed earlier conclusions that reductions in gasoline volatility and light-olefin content below current Los Angeles values offer little potential for reducing atmospheric levels of photochemical smog.

Search terms: Gasoline volatility; Gasoline vapors; Smog chambers; Photochemical reactions; Smog control; Olefins; Hydrocarbons; Irradiation chambers; Premium gasoline; Nitrogen dioxide; Formaldehyde; Evaporative emission measurement; Los Angeles; Smog; Laboratory tests

HS-012 273 Fld. 5/6

A COMPOUND CYCLE EMPLOYING TWO-STAGE COMBUSTION TO REDUCE AUTOMOTIVE AIR POLLUTION

by R. Decher; A. Hertzerg; R. C. Corlett

Washington Univ., Seattle, W07200

1972 11p 21refs
Report no. SAE-720736

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

This paper presents a compound engine concept that has the potential of significantly reducing exhaust emissions. This cycle is based on a combination of components of the spark-ignition engine and the gas turbine. The cycle utilizes a two-stage combustion process involving fuel-rich combustion at high temperatures to reduce NO_x formation and followed by lean burning to eliminate unburned hydrocarbons in a thermodynamically productive manner. A thermodynamic analysis of this cycle and a comparison with the conventional otto cycle is presented. The combustion processes involved are examined and methods of implementing this cycle in a practical manner are shown. The results of this analysis indicate that a practical automotive power cycle with excellent part load and transient response characteristics is possible via this approach.

Search terms: Exhaust emission control; Compound engines; Fuel combustion; Nitrogen oxides; Hydrocarbons; Thermodynamics; Hybrid engines; Otto cycle engines; Spark ignition engines; Dual combustion engines; Fuel economy; Mathematical models; Compression ratio; Air flow rates; Power output; Air pollution emission factors; Thermal efficiency

AVAILABILITY: SAE

HS-012 278 Fld. 5/6; 5/4

GM'S "HOTTEST" AUTOMOTIVE EMISSION ELIMINATOR

by J. M. Callahan

Published in *Automotive Industries* v147 n4 p25-8 (15 Aug 1972)

1972

The early fuel evaporation (EFE) system being developed by General Motors is described. The EFE uses exhaust heat to evaporate the liquid gasoline that passes through the carburetor at start up. By this method the gasoline engine is being

made to operate like a liquid propane gas or a natural gas engine. GM reports that EFE has eliminated up to 90% of the CO produced during the cold starting of 1972 engines. Unburned hydrocarbons are also slightly reduced by the new system. NOX is increased slightly.

Search terms: Exhaust emission control; Vehicle air pollution; Intake manifolds; Chokes; Engine modification; Carbon monoxide; General Motors Corp.; Hydrocarbons; Nitrogen oxides; Cold weather starting; Early fuel evaporation system

HS-012 279 Fld. 5/6; 5/4; 4/7

APPROACHES TO DESIGN OF LOW-EMISSION GAS-TURBINE COMBUSTION CHAMBERS

by D. M. Dix; E. K. Bastress

Northern Res. and Engineering Corp., N71000

1972 21p 21refs
Contract DOT-FA79WA-2428; 68-04-0017
Report no. SAE-720728

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

The elements and results of a technical approach to the design of low-emission gas-turbine combustors are described. The role of emissions modeling, the major features of an emissions model, the integration of conventional combustor design methodology with an emissions model, and the application of the combined methodology to specific design approaches are examined. The results indicate that emissions models that include nonuniformity of local gas conditions are of immediate utility in the design process, but that further effort in relating this nonuniformity to both conventional design parameters and conventional performance parameters is required. Applications to specific design approaches indicate that very limited emission reduction is obtainable by purely aerodynamic means and that improved fuel injection offers more potential for emission reduction, but that the most stringent emission standards will require either variable-air-distribution or variable-fuel-distribution combustors.

Search terms: Combustion chamber design; Gas turbine engines; Mathematical models; Exhaust emission control; Nitrogen oxides; Carbon monoxide; Hydrocarbons; Particulate air pollutants; Fuel flow; Fuel injection; Performance characteristics; Air fuel ratio; Air flow; Combustion; Aircraft engines; Automobile engines

AVAILABILITY: SAE

HS-012 299 Fld. 5/6

QUANTITATIVE SYSTEMS FOR MEASURING KNOCK

by V. Arrigoni; G. Cornetti; B. Gaetani; P. Ghezzi

Published in *Institution of Mechanical Engineers Proceedings* v186 n48/72 p575-83 (1972)

1972 17refs

This paper describes two methods for measuring the knock intensity in spark ignition engines in bench and road tests. The measurements are based on the detection of the characteristic pressure oscillations in the combustion chamber by means of a pressure transducer for the first instrument and on the detection of the characteristic vibrations of the engine head by means of an accelerometer fixed to the engine head for the second instrument. Particular emphasis was placed on the detection of knock at high constant speed and under low speed acceleration conditions.

Search terms: Knock; Detonation; Preignition; Accelerometers; Combustion chambers; Vibration analysis; Mathematical analysis; Pressure transducers; Engine tests; Engine performance; Spark ignition engines; Cylinder heads; Engine speeds; Engine noise; Pressure time histories

HS-012 304 Fld. 5/6

EXHAUST EMISSION CONTROL IN MEDIUM SWIRL RATE DIRECT INJECTION DIESEL ENGINES

by R. F. Parker; J. W. Walker

Deere and Co., D07200

1972 7p 14refs
Report no. SAE-720755

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

Test work was conducted on engines in the 50-200 horsepower range. An analysis of emissions reporting techniques is discussed, including a comparison of on-highway and agricultural weighting factors for the 13 mode cycle. Naturally aspirated, turbocharged, and turbocharged-intercooled versions of a basic engine family are compared, along with possible emissions reductions by exhaust gas recirculation on a naturally aspirated engine and retarded injection timing on turbocharged engines. The increase in fuel cost for nitrogen dioxide reduction by retarded timing is presented.

Search terms: Diesel engine exhaust emissions; Farm tractors; Nitrogen dioxide; Exhaust gas recirculation; Combustion chamber swirl; Exhaust emission control; Fuel injection; Turbochargers; Injection timing; Fuel costs; Engine speeds; Exhaust emission tests

AVAILABILITY: SAE

HS-012 305 Fld. 5/6

A SYSTEMS APPROACH TO VEHICLE EMISSION CONTROL

by E. N. Cantwell; R. A. Hoffman; I. T. Rosenlund; S. W. Ross

Du Pont De Nemours (E. I.) and Co., D28200

1972 23p 18refs
Report no. SAE-720510

Presented at National Automobile Engineering Meeting, Detroit, 22-26 May 1972.

Exhaust manifold thermal reactors, exhaust gas recirculation, and exhaust particulate trapping systems can be integrated to give a viable total emission control system. Total emission control vehicles have been developed which meet the exhaust emission standards which have been proposed by California. These total integrated systems have been further developed to approach the current U. S. emission standards for 1975-1976 and with additional development may meet these standards. The attainment of very low levels of nitrogen oxides has resulted in large losses in fuel economy with the systems developed to this date, but further development may partially alleviate these losses. Components of the total emission control system have demonstrated excellent durability, and it should be possible to build such a total system to last the lifetime of a passenger vehicle with little or no maintenance and little deterioration in emission control.

Search terms: Exhaust manifold reactors; Exhaust gas recirculation; Particulate traps; Engine modification; Exhaust emission control devices; Hydrocarbons; Carbon monoxide; Nitrogen oxides; Exhaust emission standards; Fuel economy; Exhaust emission tests; Exhaust emissions measurement; Vehicle performance; Durability tests; Engine wear; Thermal reactors; Systems analysis; Air pumps

AVAILABILITY: SAE

HS-012 316 Fld. 5/6

STUDY OF THE INTERACTIONS OF FUEL VOLATILITY AND AUTOMOTIVE DESIGN AS THEY RELATE TO DRIVEABILITY. FINAL REPORT

by R. J. Wahrenbrock

Ethyl Corp., E21600

1972 158p refs
Contract CPA-22-69-66; CRC-APRAC-CAPE 4-68-(2-68)
Report no. ER-441; CRC-APRAC-CAPE-4-68-5; PB-210 353

The program specified that driveability, evaporative emissions, and exhaust emissions be evaluated in 12 cars adjusted to manufacturers' specifications, at four ambient temperature levels, with eight specially blended fuels of different front end and/or mid-range volatility. The temperatures selected were 20°F, 45°F, 70°F and 95°F. The fuels used included three vapor pressure and three mid-boiling range temperature levels. The driveability phase of the program was run on a controlled weather chassis dynamometer. Factors evaluated included coldstart ability, warm vehicle operation, vapor lock, effect of engine modification, dynamometer versus road tests, and the effects of driving style, automobile model, and ambient temperature changes.

Search terms: Fuel volatility; Gasoline volatility; Coldstarts; Hotstarts; Exhaust emission tests; Driveability; Chassis dynamometers; Vehicle acceleration tests; Evaporative emissions; Engine design; Vapor lock; Engine modification; Ambient temperatures; Road tests; Idling; Surge; Stalling; Engine operating conditions; Engine performance; Automobile models

AVAILABILITY: NTIS

5/9 Inspection

HS-012 285 Fld. 5/9; 4/1

THE FUTURE FOR AUTOMOTIVE DIAGNOSTIC SYSTEMS

Anonymous

Published in *Journal of Automotive Engineering* v80 n9 p21-8 (Sep 1972)

1972

Automated diagnostic equipment is needed to provide maintenance information to drivers and mechanics and for instantaneous evaluation in regulatory inspection. Computerized and automatic diagnostic systems are discussed. The U. S. Army Tank-Automotive Command built-in test equipment program aimed at reducing faulty diagnosis and the time to diagnose malfunctions is described. Advanced scientific tools proposed for evaluating the condition of vehicles include: gas chromatography, fiber optic techniques, pulsed laser holography, and ultrasonic, infrared, microwave and X-ray techniques. A summary of motor vehicle diagnostic-related legislation from 1966-1972 is presented.

Search terms: Automated inspection equipment; Computerized test methods; Diagnostic centers; Automobile tests; Inspection laws; Measuring instruments

HS-012 312 Fld. 5/9

MOTOR VEHICLE INSPECTION

by L. J. Bintz; C. E. Dauchy; M. R. Appleby

Automobile Club of Southern California, A79400

1970 54p refs

Information related to the effectiveness of motor vehicle inspection as a means of reducing highway fatalities was collected from 37 states. The arguments pro and con, costs, nature of the inspection, relation of mechanical defects to accidents, and the present and future status of inspection are discussed. It was

ascertained from the statistics that there is no evidence that can be cited to prove that periodic vehicle inspection reduces the death rate. The basic premises of periodic motor vehicle inspection are that defective vehicles cause accidents and that inspection removes defective vehicles from the road. These premises are questioned.

Search terms: Vehicle inspection; Inspection costs; Inspection fees; Inspection stations; Fatality rates; Inspection laws; Inspection effectiveness; Automobile defects; Accident rates; Failure caused accidents; Accident causes; Defective vehicles; Automobile repair costs; Statistical analysis

AVAILABILITY:
Corporate author $1.00

5/14 Occupant Protection

HS-012 315 Fld. 5/14

AIR BAGS: MORE QUESTIONS THAN ANSWERS

by A. B. Shuman

Published in *Motor Trend* v24 n10 p64-7, 114, 116 (Oct 1972)

1972

Air bag restraint systems are discussed and major components of the basic air bag system (crash sensor, energy source, release mechanism, distribution manifold, air bag, and readiness indicator-malfunction detector) are briefly described. Air bag problems discussed include noise and overpressure, toxicity of generated gas, out-of-position occupants, children, benefit-cost ratios, use in other than front seats, shelf life of the system, handling and storage of explosives, and disarming systems on vehicles being scrapped. It is suggested that seat belts are safer than air bags and that their effectiveness is well established.

Search terms: Air bag restraint systems; Vehicle safety standards; Sensors; Air bag inflation devices; Air bag inflation time; Restraint system failures; Restraint system tests; Air bag caused injuries; Human body precrash position; Ear injuries; Benefit cost analysis; Air bag deployment forces; Noise tolerances; Aspirator inflation devices; Seat belt effectiveness

HS-012 320 Fld. 5/14; 5/18

EFFECTIVENESS OF LAP SEAT BELTS AND THE ENERGY-ABSORBING STEERING SYSTEM IN THE REDUCTION OF INJURIES

by D. N. Levine; B. J. Campbell

Published in *Journal of Safety Research* v4 n3 p106-18 (Sep 1972)

1972 4refs

Data were extracted from vehicle accident reports in North Carolina in 1966 and 1968 and were divided into four mutually exclusive groups determined by reported seat belt use or nonuse and presence or absence of the energy-absorbing steering system (EAS). When driver injury was compared among groups, the effect of the two devices was discernible. Significant reductions in injuries were associated with the EAS for medium speed frontal impact and medium speed ran off road accidents; the magnitude of the reduction was about 30%. For seat belts, reductions were observed in these situations as well as many others. The largest reductions were for high speed accidents and an overall reduction was estimated at 43%. In contrast to previous studies, seat belts were found to provide significant benefit in frontal impact situations. The reductions were greater for the serious injury grouping than for the any injury grouping. The benefits provided by the two devices were independent of one another and, therefore, additive.

Search terms: Seat belt effectiveness; Energy absorbing steering columns; Front end collisions; Side impact collisions; Rear end collisions; Vehicle vehicle collisions; Multiple vehicle accidents; Ran off road accidents; High speed caused accidents; Low speed caused accidents; Vehicle fixed object collisions; Injury probability; Injury prevention; Statistical analysis; North Carolina; Injury severity; Safety device effectiveness

HS-012 323 Fld. 5/14

FACTORS ASSOCIATED WITH SEAT BELT USE IN FAMILIES

by A. F. Williams

Published in *Journal of Safety Research* v4 n3 p133-8 (Sep 1972)

1972 9refs
Grant PHS-1-R21-DH-00190

Use of seat belts as reported by ninth grade students and their parents in a questionnaire survey indicated that seat belt use was low, but children were likely to use seat belts if one parent, and especially if both parents, did; if one parent used seat belts, the other was likely to as well. Education of mother and father were strong indicators of their own use of seat belts and of their children's use. Parental use and education had independent and cumulative associations with their child's use of seat belts, with use by parents being the more important indicator of the child's use. A personality characteristic, internal control, was related to seat belt use in girls and mothers. Seat belt use among parents and children was found to be associated with a variety of preventive health behaviors.

Search terms: Seat belt usage; Driver educational levels; Adolescents; Parent child relations; Hygiene; Psychological factors; Surveys

5/15 Propulsion Systems

HS-012 284 Fld. 5/15; 5/6; 5/2

BROBECK STEAM BUS ENGINE CUTS EXHAUST EMISSIONS

by F. C. Younger

Published in *Journal of Automotive Engineering* v80 n9 p43-7 (Sep 1972)

1972

Based on SAE-720684 "Characteristics of the Brobeck Steam Bus Engine".

The Brobeck steam engine developed for the California Steam Bus Demonstration Project gives performances comparable to that of the original diesel engine, with significantly lower exhaust emissions. Even with higher fuel consumption, emissions per brake horsepower are significantly lower than the diesel. External noise levels of the demonstration bus are lower than the original bus. The power plant design of the steam bus is described and the results of performance tests are discussed.

Search terms: Steam engines; Steam buses; Exhaust emission control; Boilers; Engine Design; Expander design; Control equipment; Performance tests; Engine performance; Power output; Fuel consumption; Vehicle noise; Exhaust emissions measurement

5/18 Steering Control System

HS-012 283 Fld. 5/18; 5/4

DEVELOPMENT OF A HYDRO-MECHANICAL STEERING TRANSMISSION

by R. J. Dorgan; R. L. Rio; D. M. Latson

General Electric Co., G04800; Army Tank-Automotive Command, A67800

1972 9p
Report no. SAE-720726

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

The advantages of infinitely variable ratio steering and propulsion for track laying vehicles are well known. Studies and demonstrator programs in the past decade have indicated that the hydromechanical transmission has the most promise of providing infinitely variable ratio for military vehicles. In 1966 the Army launched a program to develop the hydromechanical transmission to production ready status. This paper describes that program, the transmission selected, and some of the problems encountered in the transition from the demonstrator stage to one of readiness for military application.

Search terms: Steering systems; Military vehicles; Starting; Tracked vehicles; Hydromechanical transmissions; Linkages; Proving ground tests; Control equipment

AVAILABILITY: SAE

HS-012 295 Fld. 5/18; 5/20

THEORETICAL INVESTIGATION AND EXPERIMENTAL MEASUREMENTS OF TRAILER SWING OF ARTICULATED VEHICLES

by B. P. Chinn; I. D. Neilson

Transport and Road Res. Lab. (England) T33900

1972 24p 2refs
Report no. TRRL-LR-503

Trailer swing is the condition of an articulated vehicle when its trailer wheels are locked and hence the trailer does not necessarily follow the tractor unit but tends to swing out during cornering. It differs from jackknifing in that trailer swing is shown to be a quasi-steady phenomenon for which there is a particular angle of swing for steady conditions of lateral and forward acceleration or deceleration of the unit. A theoretical approach to the calculation of angle of trailer swing and also details of practical experiments carried out with an articulated commercial vehicle are presented. Predictions of these angles are based on a formula derived from a theoretical representation and good agreement is obtained. The formula shows that the angle of trailer swing may reach 90° or more and shows how it is related to speed, lateral and longitudinal accelerations, trailer tire sliding friction, and the geometric layout of the trailer and its load. The practical implications and possible means of preventing trailer swing are discussed.

Search terms: Articulated vehicles; Cornering; Wheel locking; Truck trailers; Lateral acceleration; Coefficient of friction; Equations of motion; Equations of equilibrium; Vehicle center of gravity; Tire side forces; Tire slip motion; Truck stability; Mathematical models; Load transfer; Pavement surface texture

HS-012 303 Fld. 5/18; 5/1; 4/7

APPLICATION OF THE PARAMETER PLANE METHOD TO THE HANDLING OF A VEHICLE UNDER EMERGENCY CONDITIONS

by R. R. Guntur

Technische Hogeschool, Delft (Netherlands), T08100

1972 10p 11refs
Report no. SAE-720356

Presented at National Automobile Engineering Meeting, Detroit, 22-26 May 1972.

The parameter plane method gives clearer insight into the behavior of a vehicle under emergency braking conditions. The advantage of the method lies in the use of two independent parameters instead of one. Information about the stability of a vehicle is obtained in a convenient form and may be used in

designing an adaptive braking system. The effect of wheel locking on the handling characteristics of the vehicle is studied; the degree of instability is redefined as a nondimensional number, and its utility is indicated. If a specified degree of stability is to be achieved, the roots of the characteristic equation of the system must lie within specified boundaries of the complex s-plane. These boundaries may be mapped on the parameter plane. An adaptive brake control system may be designed to confine the movement of the operating point to the region thus specified.

Search terms: Vehicle handling; Wheel locking; Vehicle stability; Vehicle dynamics; Mathematical models; Equations of motion; Parameters; Wheel slip control; Antiskid devices; Braking

AVAILABILITY: SAE

5/21 Used Vehicles

HS-012 287 Fld. 5/21; 5/11; 5/9

SOCIAL AND ECONOMIC IMPACT OF FEDERAL SAFETY PERFORMANCE STANDARDS FOR MOTOR VEHICLES IN USE

National Hwy. Safety Bureau, N18000

1971 60p 26refs

The impact, influences, and the socio-economic benefits of the federal safety performance standards for motor vehicles in use on the general public and in its operation of motor vehicles are discussed. It is necessary that motor vehicle in use safety standards be established to define acceptable levels of motor vehicle safety performance, and to assure that those performance levels are met through adequate inspection and maintenance. In analyzing the social and economic impact of motor vehicle in use safety performance standards, consideration is given to and an evaluation made of the trends and developments that are bringing change to the motor vehicle after-market industry, and to the associated manpower requirements.

Search terms: Inspection standards; Vehicle maintenance; Mechanics (personnel); Benefit cost analysis; Diagnostic centers; Vehicle inspection; Preventive maintenance; Automobile repair; Federal role; Sociological factors; Economic factors; Defects; Automotive parts industry; Repair industry; Inspection costs; Repair costs; Service life; Maintenance costs; Vehicle age; Automobile ownership

5/22 Wheel Systems

HS-012 313 Fld. 5/22; 5/18; 4/7

A DYNAMIC ANALYSIS OF AN AUTOMOBILE WITH UNBALANCED WHEELS

by S. L. Chiang; W. W. Feng; E. A. Saibel

Published in *High Speed Ground Transportation Journal* v6 n2 p213-23 (Summer 1972)

1972 6refs

A mathematical model of an automobile with unbalanced wheels is developed. Transient responses of this ten-degree-of-freedom automobile with unbalanced wheels can be examined for either braking or acceleration under a variety of maneuvers with different road conditions. Vibrations in the longitudinal and vertical directions of the unbalanced wheels are examined. The effects of unbalanced wheels upon the handling of the automobile are discussed.

Search terms: Mathematical models; Automobile handling; Wheel balancing; Wheel vibration; Equations of motion; Vehicle dynamics; Tire deflection; Tire road contact forces; Tire slip motion; Degrees of freedom; Steering force; Rear wheel drives

*U.S. GOVERNMENT PRINTING OFFICE 513-005

NHTSA CONTRACT AWARDS

Abstracts are arranged by contract number (e.g. DOT-HS-018-3-597)

DOT-HS-001-3-607

UNIFORM TIRE QUALITY GRADING - TREADWEAR

Automotive Research Associates, Inc.
5404-08 Bandera Road
San Antonio, Texas 78238

19 Jan 73 to 23 Jul 73

$9,498

This program has the following objectives: to determine the suitability of the 8.55 S.A.E.-Tire Committee recommended standard tire as a control for treadwear tests; to test whether a standard tire of one given construction is a suitable comparative tire against which tires having other constructions can be rated; to test whether treadwear ratings obtained by the proposed standard tire method will yield similar values when there are reasonable differences in locale, test routes, vehicles and/or techinques. Other types of tires to be tested are: 215R15 (4PR)-radial, H78-15 (4PR)-belted polyester/glass, H78-15 (4PR)-bias nylon-4 ply.

DOT-HS-026-3-606

UNIFORM TIRE QUALITY GRADING-TREADWEAR

Compliance Testing, Incorporated
Post Office Box 351
Ravenna, Ohio 44266

19 Jan 73 to 23 Jul 73

$9,280

This program has the following objectives: to determine the suitability of the 8.55 S.A.E.-Tire Committee recommended standard tire as a control for treadwear tests; to test whether a standard tire of one given construction is a suitable comparative tire against which tires having other constructions can be rated; to test whether treadwear ratings obtained by the proposed standard tire method will yield similar values when there are reasonable differences in locale, test routes, vehicles and/or techinques. Other types of tires to be tested are: 215R15 (4PR)-radial, H78-15 (4PR)-belted polyester/glass, H78-15 (4PR)-bias nylon-4 ply.

DOT-HS-046-2-264. Amend. 6

BASIC RESEARCH IN CRASHWORTHINESS-REAR-END STRUCTURES

Dynamic Science
1800 West Deer Valley Drive
Phoenix, Arizona 85027

Mod. period 2 Feb 73 to 1 May 73

Increased by $3,807

The purpose of the amendment is to develop a Plan of Work and Methodology for conducting railroad accidents. Four of these are to be automobile-locomotive, one locomotive-locomotive, one tank car-locomotive, and one tank car-freight car. Full instrumentation and camera coverage are to be provided.

DOT-HS-046-3-592

EXTERIOR PROTECTION, PASSENGER CARS

Dynamic Science
1850 West Pinnacle Peak Road
Phoenix, Arizona 85027

12 Jan 73 to 13 Jan 74

$34,925

This contract requires 20 compliance tests for exterior protection in passenger cars in accordance with Federal Motor Vehicle Safety Standard No. 215. Barrier tests are to be conducted within the following speed tolerances: 4.80 mph to 4.95 mph for forward crashes, 2.30 mph to 2.45 mph for rearward crashes.

DOT-HS-053-3-603

DEVELOPMENT OF PERFORMANCE REQUIREMENTS FOR 50TH PERCENTILE ANTHROPOMOPHIC TEST DEVICES

Calspan
Post Office Box 235
Buffalo, New York 14221

17 Jan 73 to 18 Apr 73

$67,800

The objective of this contract is the establishment of the measure of test dummies repeatability, based on statistical evaluation of the test results. Sled tests simulating a 30 mile per hour barrier crash shall be accomplished - 20 tests employing the three point belt restraint and 20 air bag tests. The data derived from these tests and measurements will be included in the information to be employed in the formulation of a formal rule, standardizing the test dummy as a compliance tool.

DOT-HS-137-1-210. Amend. 5

FATALITY ANALYSIS FILE

Genasys Corporation
2011 Eye Street, N.W.
Washington, D.C. 20006

24 Jan 73 to 01 Mar 73

$16,298

The purpose of this contract modification is: (a) to provide interim operational support for the initial processing of Fatality Analysis File Case Record reports submitted by the participating states; (b) to study alternatives and provide recommendations for the most feasible encoding and input methodology for Fatality Analysis File data.

DOT-HS-214-3-591

EXTERIOR PROTECTION, PASSENGER CARS

Agbabian Associates
250 North Nash Street
El Segundo, California 90245

12 Jan 73 to 13 Jan 74

$48,720

This contract requires 20 compliance tests for exterior protection in passenger cars in accordance with Federal Motor Vehicle Safety Standard No. 215. Barrier tests are to be conducted within the following speed tolerances: 4.80 mph to 4.95 mph for forward crashes, 2.30 mph to 2.45 mph for rearward crashes.

DOT-HS-317-3-608

TIRE TEST DATA MANAGEMENT SYSTEMS

Control Data Corporation
Professional Services Division
901 South Highland Street
Arlington, Virginia 22204

22 Jan 73 to 23 Jan 74

$34,909

The objective of this contract is to establish a computer-based control system for tire test data. This system shall not only make accessible, test results but also financial reports. In addition the system should be capable of conducting special studies other than failure rate analyses.

SAFETY-RELATED PUBLICATIONS

1
Accident Pathology. Proceedings of an International Conference, Washington, D.C., June 6-8, 1968. For sale by the Superintendent of Documents – $4.75. Order No. TD8.2:AC2.

2
Agricultural Tractor Safety on Public Roads and Farms. A Report to the Congress from the Secretary of Transportation. January 1971. For sale by the Superintendent of Documents – $5.25. Order No. TD1.2:T67.

3
Alcohol and Alcohol Safety, A Curriculum Manual for Elementary Level. Volume I of II. For sale by the Superintendent of Documents – $3.50. Order No. TD8.8A1 1/4/V1,

4
Alcohol and Alcohol Safety, A Curriculum Manual for Elementary Level, Teacher's Activities Guide. Volume II of II. For sale by the Superintendent of Documents – $5.25. Order No. TD8.8:Al 1/4/V2.

5
Alcohol and Alcohol Safety, A Curriculum Manual for Junior High Level. Volume I of II. For sale by the Superintendent of Documents – $3.75. Order No. TD8.8:Al 1/5/V1.

6
Alcohol and Alcohol Safety, A Curriculum Manual for Junior High Level, Teacher's Activities Guide. Volume II. of II. For sale by the Superintendent of Documents – $8.00. Order No. TD8.8 Al 1/5/V2.

7
Alcohol and Alcohol Safety, A Curriculum Manual for Senior High Level. Volume I of II. For sale by the Superintendent of Documents – $3.75. Order No. TD8.8:Al 1/6/V1.

8
Alcohol and Alcohol Safety, Curriculum Manual for Senior High Level, Teacher's Activities Guide. Volume II of II. For sale by the Superintendent of Documents – $8.75. Order No. TD8.8:Al 1/6/V2.

9
Alcohol Countermeasures, Report on 1971 Forum. June 30, 1971. For sale by the Superintendent of Documents – 60¢, Order No. TD8.2:Al 1/2/971.

10
Alcohol Safety Action Projects, First Year Evaluation Preview. June 1972. For sale by the Superintendent of Documents – 40¢. Order No. TD8.2:Al 1/3/972.

11
Alcohol Safety Countermeasures Program. June 8, 1970. Limited copies available from General Services Division, NHTSA on request.

12
Ambulance Design Criteria. January 1973. For sale by the Superintendent of Documents – 50¢. Order No. TD8.2:Aml.

13
Annual Report. Highway Safety Act of 1966. The *first annual report* on the administration of the Highway Safety Act of 1966, for the period September 9, 1966 to December 31, 1967. For sale by the Superintendent of Documents – 55¢. Order No. 90-2:HDOC.311.

14
Annual Report. National Highway Traffic and Motor Vehicle Safety Act of 1966. The *first annual report* on the administration of the National Traffic and Motor Vehicle Act of 1966, for the period September 9, 1966 to December 31, 1967. For sale by the Superintendent of Documents – 55¢. Order No. 90-2:HDOC.310.

15
Annual Report. Highway Safety Act of 1966. The *second annual* report on the administration of the Highway Safety Act of 1966, for the period January 1, 1968 to December 31, 1968 (Vols. I and II). For sale by the Superintendent of Documents – $2.25. Order No. 91-1:HDOC.109.

16
Annual Report. National Traffic and Motor Vehicle Safety Act of 1966. The *second annual* report on the administration of the National Traffic and Motor Vehicle Safety Act of 1966, for the period January 1, 1968 to December 31, 1968 (Vols. I and II). For sale by the Superintendent of Documents – $2.25. Order No. 91-1:HDOC.110.

17
Annual Report. Highway Safety Act of 1966. The *third annual* report of the Department of Transportation on activities under the Highway Safety Act of 1966, for the period from January 1 through December 31, 1969. For

sale by the Superintendent of Documents – $2.25. Order No. 91-2:HDOC.397.

18

Annual Report. National Traffic and Motor Vehicle Safety Act of 1966. The *third annual* report of the Department of Transportation on activities under the National Traffic and Motor Vehicle Safety Act of 1966, for the period from January 1 through December 31, 1969. For sale by the Superintendent of Documents – $2.25. Order No. 91-2:HDOC.398.

19

Annual Report. Highway Safety Act of 1966 and National Traffic and Motor Vehicle Safety Act of 1966. The *fourth annual* report of the Department of Transportation on activities under the Highway Safety Act of 1966 and the National Traffic and Motor Vehicle Safety Act of 1966, for the period January 1 through December 31, 1970. Order as follows from Superintendent of Documents.

1 – Highway and Traffic Safety, TD8.12/3:970. $1.00

2 – 1970 Report On Activities Under Highway Act. TD8.12/2:970/Vol. 2. $1.25

3 – 1970 Report On Activities Under National Traffic and Motor Vehicle Safety Act, TD8.12:970/Vol. 2. $1.25

20

Annual Report. Highway Safety Act of 1966 and National Traffic and Motor Vehicle Safety Act of 1966. The *fifth annual* report of the Department of Transportation on Activities under the Highway Safety Act of 1966, for the period January 1 through December 31, 1971. Order as follows from Superintendent of Documents.

1 – Safety '71, An Activities Report U.S. Department of Transportation National Highway Traffic Safety Administration TD8.12/3:9711 $1.50

2 – Safety '71, A Report on Activities Under the Highway Safety Act. TD8.12/2:971/v.2 $1.25

3 – Safety '71, A Report on Activities Under the National Traffic and Motor Vehicle Safety Act. TD8.12:971/V.2 $1.25

21

Annual Report to the Secretary on Accident Investigation and Reporting Activities. April 1971. Limited copies available from General Services Division, NHTSA, on request.

22

Annual Report to the Secretary on Accident Investigation and Reporting Activities – 1971, February 1972. For sale by the National Technical Information Service – $3.00. Order No. PB 207 669.

23

Audiovisual Catalog of the National Highway Traffic Safety Administration. December 1970 – October 1971. Limited copies available from Technical Reference Division, NHTSA.

24 **Automobile Safety Belt Fact Book.** For sale by th Superintendent of Documents – 25¢. Order No. TD8.2:Au8.

25

Basic Training Program for Breath Examiner Specialist: Course Guide (With List of References). For sale by the Superintendent of Documents – 60¢. Order No. TD8.8:B74.

26

Basic Training Program for Breath Examiner Specialist: Instructor's Plans. For sale by the Superintendent of Documents – $3.00. Order No. TD8.8:B74/2.

27

Basic Training Program for Breath Examiner Specialist: Student Study Guide. For sale by the Superintendent of Documents – $1.00. Order No. TD8.8:B74/3.

28

Basic Training Program for Driver License Examiner: Course Guide. For sale by the Superintendent of Documents – 70¢. Order No. TD8.8:D83.

29

Basic Training Program for Driver License Examiner: Instructor's Lesson Plans. For sale by the Superintendent of Documents – $2.50. TD8.8:D83/3.

30
Basic Training Program for Driver License Examiner: Trainee Study Guide. For sale by the Superintendent of Documents – $1.00. Order No. TD8.8:D83/2.

31
Cars That Drunks Can't Drive. November 1969. Limited copies available on request from NHTSA, Office of Alcohol Countermeasures.

32
The Case for Seat Belts, Experimental and Statistical Evidence. January 1973. For sale by the Superintendent of Documents – 25¢. Order No. TD8.2:Se1.

33
Communications, Guidelines for Emergency Medical Services. For sale by the Superintendent of Documents – $1.00. Order No. TD8.8:Em 3/4.

34
Compliance Test Reports KWIC Index. May 1971. (See item *104* for test reports released during calendar year 1971). For sale by the National Technical Information Service – $6.00. Order No. PB 200 309.

35
Concepts and Recommendations (Basic Training Program for Emergency Medical Technician – Ambulance). Prepared by Dunlap & Associates, Inc., Under Contract No. FH 11-6967. For sale by the Superintendent of Documents – 35¢. Order No. TD2.208:EM3.

36
Course Guide and Course Coordinator Orientation Program (Basic Training Program for Emergency Medical Technician – Ambulance). Prepared for Dunlap & Associates, Inc., under Contract No. FH 11-6967. For sale by the Superintendent of Documents – 35¢. Order No. TD2.208:EM3/2.

37
Dispatcher, Emergency Medical Technician, Training Course. For sale by the Superintendent of Documents – 60¢. Order No. TD8.8:D63.

38
Driver Exposure Indirect Approach for Obtaining Relative Measures. March 1972. For sale by the National Technical Information Service – $3.00. Order No. PB 209 710.

39
Drug Use and Highway Safety: A Review of the Literature. (by James L. Nichols). July 1971. For sale by the Superintendent of Documents – $1.25. Order No. TD8.2:D84.

40
Economics of Highway Ambulance Service. March 1969. For sale by the Superintendent of Documents – 65¢. Order No. TD2.202:AM7.

41
An Evaluation of a Safety Belt Interlock System. February 1971. Available from National Technical Information Service – $3.00. Identify as PB 197 755.

42
Evaluation of Length-of-Stain Gas Indicator Tube for Measuring Carbon Monoxide In Air. November 1971. For sale by the National Technical Information Service – $3.00. Order No. PB 213 437.

43
Evaluation Report, Alcohol Safety Projects, 1971. C. Burkhart. Et Al. May 1972. For sale by the National Technical Information Service – $4.50. Order No. PB - 211 067.

44
Examining the Parameters of the Human Element in a Program Matrix for Highway Safety Research. February 1972. Limited copies available from General Services Division, NHTSA. Order No. DOT HS - 820 191.

45
Executive Summaries–National Highway Safety Bureau Contractors Reports. January 1968 through February 1969. For sale by the Superintendent of Documents – $1.75. Order No. TD2.212:968-69.

46
Experimental Safety Cars Study – Condensation of a report prepared for the National Highway Safety Bureau by Republic Aviation Division of Fairchild Hiller. December 1969. For sale by the Superintendent of Documents – 75¢. Order No. TD2.202:C23.

47
Fatality Trend Charts. Quarterly. Available from Mathematical Analysis Division, National Highway Traffic Safety Administration.

49
Not used

50
Fact Sheets. In format of National Highway Traffic Safety Administration News Releases. Limited copies available from Office of Consumer Affairs and Public Relations, NHTSA.

1 – The Hazards of "Mixing" Tire Types. 1972.
2 – "Minibikes" – What Every Parent Should Know. 1971.
3 – NHTSA and the Consumer. 1973.
4 – Safety Belts in '72: A Step Closer to Automatic Crash Survival, 1972.
5 – Studded Tires. 1971.
6 – Three Rules for Maximum Tire Life. 1973.

51
Federal Motor Vehicle Safety Standards, With Amendments and Interpretations issued Through July 1972 (looseleaf). For sale by the Superintendent of Documents, by subscription – $26.00 domestic; $32.50 foreign. Order No. TD8.6:M8 5/2/972.

52
Highway Safety Literature: An Announcement of Recent Acquisitions. Available from General Services Division, NHTSA on request.

53
Federal Motor Vehicle Safety Standards Including Import Regulations. March 31, 1971. For sale by the Superintendent of Documents – 25¢. Order No. TD8.6:M85.

54
Highway Safety Literature: An Announcement of Recent Acquisitions. Available from General Services Division, NHTSA on request.

volumes). For sale by the General Services Division, NHTSA. Individual volume titles and costs are listed below:

Vol. 0 –	Planning and Administration.	$1.95
Vol. 1 –	Periodic Motor Vehicle Inspection.	3.15
	Supplement 1 to Volume 1	1.00
Vol. 2 –	Motor Vehicle Registration.	2.30
	Supplement 1 to Volume 2	1.00
Vol. 3 –	Motorcycle Safety.	2.80
	Supplement 1 to Volume 3	1.00
Vol. 4 –	Driver Education	2.15
	Supplement 1 to Volume 4	1.00
Vol. 5 –	Driver Licensing.	2.70
	Supplement 1 to Volume 5	1.00
Vol. 6 –	Codes and Laws.	1.10
	Supplement 1 to Volume 6	1.00
Vol. 7 –	Traffic Courts	1.70
Vol. 8 –	Alcohol in Relation to Safety.	2.80
Vol. 9 –	Identification and Surveillance of Accident Locations.	2.00
Vol. 10 –	Traffic Records.	4.00
Vol. 11 –	Emergency Medical Services.	6.50
	Supplement 1 to Volume 11	1.30
Vol. 12 –	Highway Design, Construction and Maintenance.	3.00
Vol. 13 –	Traffic Control Devices	Not Issued
Vol. 14 –	Pedestrian Safety.	3.95
Vol. 15 –	Police Traffic Services.	2.70
	Supplement 1 to Volume 15	1.00
Vol. 16 –	Debris Hazard Control and Cleanup.	2.75

Vol. 17 –	Pupil Transportation Safety	(In Press)
Vol. 18 –	Accident Investigating and reporting	2.75
Vol. 102 –	Comprehensive Plan and Annual Work Program. Sept. 1972.	(Free on Request).
Vol. 103 –	Highway Safety Work Program.	(Free on Request).

56

Highway Safety Program Standards. June 1969. For sale by the Superintendent of Documents – 45¢. Order No. TD2.208:St2/969.

57

Instructor's Lesson Plans (Basic Training Program for Emergency Medical Technician – Ambulance). Prepared by Dunlap & Associates, Inc., under Contract No. FH 11-6967. For sale by the Superintendent of Documents – $2.50. Order No. TD2.208:EM3/3.

58

International Conference on Passive Restraints. General Motors Proving Grounds, Milford, Michigan, May 11-12, 1970. Sponsor: North Atlantic Treaty Organization; Co-Hosts: U.S. Department of Transportation and U.S. Automobile Industry. For sale by the National Technical Information Service – $3.00. Identify as PB 194 027.

59

Local Participation in State and Community Highway Safety Program. November 1969. Available from General Services Division, NHTSA, on request.

60

Manual on Uniform Traffic Control Devices for Streets and Highways, 1971. For sale by the Superintendent of Documents – $3.50. Order No. TD2.8:T67.

61

Monarch Pass, Colorado. Schoolbus Crash. March 1972. For sale by the National Technical Information Service – $3.00. Order No. PB 208 623.

62

Motor Vehicle Emissions: A Selected Bibliography. October 1970. Limited copies available from the Technical Reference Division, NHTSA on request.

63

Motor Vehicle Emissions: A Selected Bibliography. May 1972. Limited copies available from Technical Reference Division, NHTSA. Order No. DOT HS 820 190.

64

Motor Vehicle Safety Defect Recall Campaigns from January 1, 1970 to December 31, 1970. For sale by the Superintendent of Documents – 45¢. Order No. TD8.9:970/4.

65

Motor Vehicle Safety Defect Recall Campaigns from January 1, 1971 to March 31, 1971. For sale by the Superintendent of Documents – 15¢. Order No. TD8.9:971/1.

66

Motor Vehicle Safety Defect Recall Campaigns from April 1, 1971 to June 30, 1971. For sale by the Superintendent of Documents – 25¢. Order No. TD8.9:971/2.

67

Motor Vehicle Safety Defect Recall Campaigns from January 1, 1971 to December 31, 1971. For sale by the Superintendent of Documents – 60¢. Order No. TD2.209:971/4.

68

Motor Vehicle Safety Defect Recall Campaigns from January 1, 1972 to March 31, 1972. For sale by the Superintendent of Documents – 30¢. Order No. TD8.9:972/1.

69

Motor Vehicle Safety Defect Recall Campaigns, from April 1, 1972 to June 30, 1972. For sale by the Superintendent of Documents – 40¢. Order No. TD8.9:972/2.

70

Motor Vehicle Safety Defect Recall Campaigns from July 1, 1972 to September 30, 1972. For sale by the Superintendent of Documents – 55¢. Order No. TD8.9:972/3.

71

Motor Vehicle Safety Defect Recall Campaigns. Detailed Reports available from National Technical Information Service.

Highway Safety Bureau, May 68, 87pp. . . . . .NHSB Recall Identification Numbers 66-0010 to 67-0096. PB-177 301 $6.00

Same Title, CHRYSLER MOTORS CORP., 94pp. . . . . .NHSB Recall Identification Numbers 66-0002A to 66-0017. PB-117 302 $6.00

Same Title, CHRYSLER MOTORS CORP., 140pp. . . . . .NHSB Recall Identification Numbers 67-0009A to 67-0045. PB-177 303 $6.00

Same Title, CHRYSLER MOTORS CORP., 80pp. . . . . .NHSB Recall Identification Numbers 67-0062 to 67-0127. PB-177 304 $6.00

Same Title, CHRYSLER MOTORS CORP., 102pp. . . . . .NHSB Recall Identification Numbers 67-0074 to 67-0127. PB-177 305 $6.00

Same Title, CLARK EQUIPMENT CO., 20pp. . . . . .NHSB Recall Identification Numbers 66-0029A to 67-0085. PB-177 306 $6.00

Same Title, FORD MOTOR CO., 100pp. . . . . .NHSB Recall Identification Numbers 66-004A to 67-0013. PB-177 307 $6.00

Same Title, FORD MOTOR CO., 120pp. . . . . .NHSB Recall Identification Numbers 67-0018 to 67-0113. PB-177 308 $6.00

Same Title, GENERAL MOTORS CORP., 77pp. . . . . .NHSB Recall Identification Numbers 66-0011A to 66-0030. PB-177 309 $6.00

Same Title, GENERAL MOTORS CORP., 82pp. . . . . .NHSB Recall Identification Numbers 66-0032A to 66-0032D. PB-177 310 $6.00

Same Title, GENERAL MOTORS CORP., 111pp. . . . . .NHSB Recall Identification Numbers 66-0033A to 67-0014. PB-177 311 $6.00

Same Title, GENERAL MOTORS CORP., 118pp. . . . . .NHSB Recall Identification Numbers 67-0016 to 67-0083. PB-177 312 $6.00

Same Title, GENERAL MOTORS CORP., 106pp. . . . . .NHSB Recall Identification Numbers 67-0088 to 67-0130. PB-177 313 $6.00

Same Title, INTERNATIONAL HARVESTER CO., 101pp. . . . . .NHSB Recall Identification Numbers 66-0019 to 67-0123. PB-177 314 $6.00

Same Title, FREIGHTLINER CORP., HARLEY-DAVIDSON MOTOR CO., KAISER JEEP CORP., MACK TRUCKS INC., SHELBY AMERICAN INC., SUPERIOR COACH CORP., WHITE MOTOR CORP., 115pp. . . . . .NHSB Recall Identification Numbers 67-1137 to 67-0090, 67-0025, 67-0002 to 67-0120, 67-0036 to 67-0060, 67-0026, 67-0043, and

MOTOR HOLDINGS (USA) INC., GM CORP. (FOREIGN DISTR. DIV) JAGUAR CARS, INC., LEYLAND MOTOR CORP., NORTH AMERICA, 79pp. . . . . .NHSB Recall Identification Numbers 66-0003 to 66-0034, 67-0012, 66-0028, 67-0058 to 67-0061, 67-0004, and 67-0114 to 67-0124. PB-177 316 $6.00

Same Title, MERCEDES-BENZ OF NORTH AMERICAN, INC., NISSAN MOTOR CORP. IN USA, PORSCHE OF AMERICA CORP., 75pp. . . . . .NHSB Recall Identification Numbers 66-0027 to 67-0077, 67-0011, and 67-0006. PB-177 317 $6.00

Same Title, RENAULT, INC., ROLLS-ROYCE, INC., SAAB (USA), INC., CHRYSLER MOTORS CORP. (SIMCA-ROOTES DIVISION), TOYOTA MOTOR SALES, USA, INC., 76pp. . . . . .NHSB Recall Identification Numbers 66-0001 to 67-0020, 66-0005A to 67-0106, 67-0128, 67-0078, and 67-0059. PB-177 318 $6.00

Same Title, VOLKSWAGEN OF AMERICA, INC., 82pp. . . . . .NHSB Recall Identification Numbers 66-006 to 67-0129. PB-177 319 $6.00

Same Title (Jan. 1 through March 31, 1968) PB-178 521 $6.00

Same Title (April 1 through June 30, 1968) PB-178 888 $6.00

Same Title (July 1 through Sep. 30, 1968) PB-179 904 $6.00

Same Title (Oct. 1 through Dec. 31, 1968) PB-182 791 $6.00

Same Title (Jan. 1 through March 1, 1969) PB-183 175 $6.00

Same Title (April 1 through June 30, 1969) PB-184 463 $6.00

Same Title (July 1 through Sept. 30, 1969) PB-185 943 $6.00

Same Title (Oct. 1 through Dec. 31, 1969) PB-188 518 $6.00

Same Title (Jan. 1 through March 31, 1970) PB-191 093 $3.00

Same Title (April 1, through June 30, 1970) PB-192 564 $6.00

Same Title (July 1 through Sept. 30, 1970) PB-194 580 $6.00

Same Title (Oct. 1 through Dec. 31, 1970) PB-196 681 $6.00

Same Title (Jan. 1 through March 31, 1971) PB-198 219 $6.00

Same Title (April 1, through June 30, 1971)
PB-200 927 $6.00
Same Title (July 1 through Sept. 30, 1971)
PB-204 227 $6.00

72

Multidisciplinary Accident Investigation Summaries. (Full case reports are available for inspection at the Administration's Technical Reference Division, Room 5108, 400 7th Street S.W., Washington, D.C. 20590. Those with PB numbers may be purchased from National Technical Information Service.)

Vol.	No.	Date	Order No.	Price
1	1	May 1970	PB 192 211	$ 6.00
1	2	June 1970	PB 193 005	$ 3.00
1	3	June 1970	PB 193 474	$ 3.00
1	4	August 1970	PB 194 608	$ 6.00
1	5	November 1970	PB 197 063	$ 3.00
1	6	December 1970	PB 197 551	$ 3.00
2	1	February 1971	PB 206 003	$ 3.00
2	2	April 1971	PB 206 004	$ 3.00
2	3	May 1971	PB 202 217	$ 3.00
2	4	September 1971	PB 206 000	$ 3.00
2	5	October 1971	PB 206 001	$ 3.00
3	1	March 1972	PB 209 505	$ 3.00
3	2	March 1972	PB 209 566	$ 3.00
3	3	June 1972	PB 211 496	$ 3.00
3	4	September 1972	PB 213 484	$ 3.00
3	5	September 1972	PB 214 022	$ 3.00
3	6	September 1972	PB 214 023	$ 3.00
3	7			(in press)
3	8	November 1972		
3	9	November 1972		

SUMMARY OF 1968 - 1969 MULTIDISCIPLINARY ACCIDENT INVESTIGATIONS

December 1969 PB 194 654 $ 3.00

SUMMARY OF 1968 - 1970 MULTIDISCIPLINARY ACCIDENT INVESTIGATION REPORTS.

Vol. 1 of 2	June 1971	PB 212 672	$ 3.00
Vol. 2 of 2	August 1972	PB 212 673	$ 3.00

Tri-Level Accident Investigation Summaries, Level 3A Injury Causation. Vol. 1, No. 1. November 1971. (This summary describes injury-producing accidents incurred between October 1970 – December 1970 and identifies the specific interior components which caused such injuries.) For sale by the National Technical Information Service – $3.00. Identify as PB-206 270.

Tri-Level Accident Investigation Summaries, Level 3A Injury Causation. Vol. 1, No. 2. January 1972. (This summary describes injury-producing accidents incurred between January 1971 – March 1971 and identifies the specific interior components which caused such injuries.) For sale by the National Technical Information Service – $3.00. Identify as PB-207 537.

73

The National Driver Register. April 1972. Limited copies available from National Driver Register, NHTSA, on request.

74

New Hope – New Possibilities. A Report to the Religious Communities on the Alcohol Safety Action Projects (ASAP). For sale by the National Technical Information Service – $3.00. Order No. PB 213 319.

75

1968 Alcohol and Highway Safety Report. August 1968. For sale by the Superintendent of Documents – 50¢. Order No. Y4.P096/11:90-34.

76

Our Needs, People, Our Challenge, Save Lives. National Highway Traffic Safety Administration Needs People Qualified to meet Challenging Task of Reducing Slaughter on Our Nation's Highways. August 1971. For sale by the Superintendent of Documents – 40¢. Order No. TD8.2:P39.

77

Passive Protection at 50 miles Per Hour June 1972. Limited copies available from General Services Division, NHTSA on Request. Order No. DOT HS 810 197.

78

Patient Handling Manual for Emergency Medical Technicians – Ambulance. January 1, 1971. For sale by the Superintendent of Documents – 60¢. Order No. TD8.8:EM3/3.

79

Performance Data for New 1971 Passenger Cars and Motorcycles. Compiled from Data Furnished by Vehicle

Manufacturers. October 1970. (Consumer Information Series, Vol. 2, No. 1) For sale by the Superintendent of Documents – $2.00. Order No. TD8.14:2/1.

1 – **Brakes; A Comparison of Braking Performance for 1971 Passenger Cars.** Compiled from Data Furnished by Vehicle Manufacturers. October 1970. (Consumer Aid Series, Vol. 1 Part 1) For sale by the Superintendent of Documents – 40¢. Order No. TD8.14/2:1/pt. 1.

2 – **Tires; A Comparison of Tire Reserve Load for 1971 Passenger Cars.** Compiled from Data Furnished by Vehicle Manufacturers. October 1971. (Consumer Aid Series, Vol. 1. Part 2) For sale by the Superintendent of Documents – 40¢. Order No. TD8.14/2:1/pt. 2.

80

Performance Data for New 1972 Passenger Cars and Motorcycles. Compiled from Data Furnished by Vehicle Manufacturers. November 1971. (Consumer Information Series, Vol. 3, No. 1) For sale by the Superintendent of Documents – $2.00. Order No. TD8.14:3/1.

1 – **Brakes; A comparison of Braking Performance for 1971 Passenger Cars.** Compiled from Data Furnished by Vehicle Manufacturers. November 1972. (Consumer Aid Series, Vol. 2, Part 1) For sale by the Superintendent of Documents – 50¢. TD8.14/2:2/pt. 1.

2 – **Tires; A Comparison of Tire Reserve Load for 1972 Passenger Cars.** Compiled from Data Furnished by Vehicle Manufacturers. November 1971. (Consumer Aid Series, Vol. 2 Part 1). For sale by the Superintendent of Documents – 45c. TD8.14/2:2/pt.2.

81

Performance Data for New 1973 Passenger Cars and Motorcycles. Compiled from Data Furnished by Vehicle Manufacturers. November 1972. (Consumer Information Series, Vol. 4) For sale by the Superintendent of Documents – $2.85. Order No. TD8.14:4

1 – **Brakes; A Comparison of Braking, Performance for 1973 Passenger Cars.** Compiled from Data Furnished by Vehicle Manufacturers. November 1972. (Consumer Aid Series, Vol. 3, Part 1) For sale by the Superintendent of Documents – 55¢. Order No. TD8.14/2:3/pt. 1.

2 – **Tires; A Comparison of Tire Reserve Load for 1972 Passenger Cars.** Compiled from Data Furnished by Vehicle Manufacturers. November 1972. (Consumer Aid Series, Vol. 3 Part 1). For sale by the Superintendent of Documents – 65¢. Order No. TD8.14/2:3/pt. 2.

82

Police Traffic Services. Basic Training Program, Course Guide. For sale by the Superintendent of Documents – 60¢. Order No. TD8.8:P75/v1.

83

Police Traffic Services, Basic Training Program, Instructor's Lesson Plans. For sale by the Superintendent of Documents – $4.75. Order No. TD8.8:P75/v2.

84

Police Traffic Services, Basic Training Program, Student Study Guide. For sale by the Superintendent of Documents – $2.25. Order No. TD8.8:P75/v3.

85

Proceedings, Forum on Traffic Safety Alcohol Countermeasures for Women's National Organizations. Presented by U.S. Department of Transportation, National Highway Traffic Safety Administration, January, 1971. Available from Superintendent of Documents – 60¢. Order No. TD8.2:AL1/2/971.

86

Proceedings of Collision Investigation Methodology Symposium. Warrenton Virginia, August 24-26, 1969, Conducted by Cornell Aeronautical Laboratory, Inc., Buffalo, New York. Available from National Technical Information Service – $9.00. Identify as PB 196 531.

87

Proceedings of the National Highway Safety Bureau Priorities Seminar. Fredericksburg, Virginia, July 18-20, 1969. For sale by the National Technical Information Service. Order by PB Numbers. Each PB $6.00.

Vol. 1. –	Background and Summary Expectations and Limitations. Final Session.	PB 186 268
Vol. 2. –	Alcohol and Highway Safety Countermeasures.	PB 186 269
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